Myanmar Dental Journal

Vol.22, No.1

January 2015

Content

Editorial.....3

Review Articles

❖ Impact of periodontal diseases on Systemic Health 4

Original Research Articles

❖ Role Of Human Papillomavirus (HPV) And Its Detection In Potentially Malignant Disorders And Oral Squamous Cell Carcinomas 9

❖ Epidemiological and Clinico-pathological study of 120 cases of Oral Cancers in Myanmar 2012 13

❖ A new peripheral tracing material for mandibular complete denture impression.....17

❖ Effect of mixing methods and disinfection on dimensional accuracy of alginate Impression 21

❖ An in vitro study on coronal microleakage of endodontic acess cavity using single seal and double seal techniques 27

❖ A comparative study on the dimensional accuracy of two types of elastomeric impression materials 33

❖ In vitro study of margical fit of ceramage crown related to different margin Designs.....41

Case Report

❖ A case report of Superior Ankyloglossia 48

Editorial

Fight against Oral Cancer

Oral cancer is the sixth most common cancer globally and majority of cases occur in South East Asia. While tobacco smoking and betel quid chewing are major risk factors, the connection with HPV 16/18 (human papilloma virus, type 16/18), which are viral and sexually transmitted, virus has to be considered seriously especially among the young individuals without any tobacco habits. Historically, the death rate associated with this cancer is particularly high, not because it is hard to discover or diagnose, but due to the cancer being routinely discovered at late stage. Moreover, it is a disease that has limited public awareness and number of cases increasing each year in developing countries.

The only hope for saving lives is with professional involvement and public awareness. As for the professional involvement, the dental community is the first line of defense against oral cancer, through the process of early detection. Including both generalist and specialists, there are nearly 3000 dentists in Myanmar. Just doing opportunistic cancer screenings of the existing patient population visit to dental office can catch oral cancer in its early stage. The good news is that if it is caught early enough then the chances of survival are substantially increased.

Oral Medicine and Oral Pathology Society are looking forward to develop Oral cancer Foundation in our country in future and collaborate with International Oral Cancer Foundations. Our goals are not only to initiate an effort within the dental community to screen all the dental patients and but also intended to drive public awareness of oral cancer. Education of the public regarding the risk factors, recognition of the early signs and symptoms are primary responsibilities of dental community.

Encouraging patients to perform self-diagnosis such as looking for ulcers that do not heal within three weeks, red or white patches in the mouth and any unusual lumps or swelling can also help towards early detection. We would like to invite all Dental professionals to participate and be as a partner with us by helping to raise awareness of oral cancer and make a positive difference to thousands of lives.

Professor Swe Swe Win
Vice President, Myanmar Dental Association and
Oral Medicine and Pathology Society
Chairman, Academic Committee

References:

1. **http://oralcancerfoundation.org**
2. **www.mouth cancer.com**

Review Article

Impact of periodontal diseases on Systemic Health

Shrinidhi[1], Usha Chikkaiah[2], Shivakumar[1]

[1] Department of Periodontics, Sharavathi Dental College and Hospital, Shivamogga, India

[2] Department of Oral Medicine & Radiology, Sharavathi Dental College and Hospital, Shivamogga, India

Abstract:

A plethora of Systemic diseases have effect on Oral health, showing their manifestations in various ways. Diabetics suffering from multiple dental problems or Tuberculosis winding its way to the gingiva are but a few of such examples. However, do the oral diseases exert any action on the general health of an individual? This has been a matter of concern both to the Medical and Dental Professionals for quite some time. Recent studies have documented that oral diseases are indeed risk factors for a variety of multi organ diseases.

Periodontal diseases are the group of diseases affecting the investing tissues of teeth. They have affected mankind since ages and still continue to haunt them leading to tooth mortality. A few of Oral diseases, or Periodontal diseases in particular create a chronic inflammatory state, wherein there is a gradual rise of pro-inflammatory mediators. Haematogenous spread of bacteria from oral cavity into systemic circulation results in marked changes in the systemic health. This risk factor can be a magnifier or an initiator for Preterm labor, Atherosclerosis, Coronary Heart Disease and Poor Glycemic control in Diabetics.

The aim of this paper is to provide a bird's eye-view of Periodontal medicine for the Practicioner as it has a profound influence on clinical practice in the current times.

Key words: Periodontal disease, Periodontal medicine, Systemic health,

INTRODUCTION:

The old Saying "Oral health is the Mirror of Systemic Health" has been accepted by the medical fraternity for quite some time[1]. The impacts systemic diseases have on the Oral tissues are well known and often it is the Oral Cavity which presents with the early signs of a disease[2]. However is the converse true? Do the dental diseases have any effect on the etiology or progression of the Systemic diseases?[2] The answer is a much awaited one .The role of oral diseases in eliciting a systemic response, in an otherwise healthy individual has often been the topic of debate in the field of current scientific research. After the dawn of Evidence Based Clinical Practice, it is absolutely essential to shed light on this aspect of Periodontal Medicine, which will provide a clear understanding of its implications on the general health of the patient[3].

Periodontal Disease:

Periodontium means structures surrounding the teeth and they are the Gingiva, Periodontal ligament (a soft collagenous tissue which attaches the root to the bone), Cementum (a hard calcified covering on the root), and Alveolar bone. Thus, Periodontal diseases are a group of diseases which affect the integrity of the teeth resulting in bone loss, tooth mobility and tooth loss[4].

The gingival crevice forms an ideal niche for the bacterial flora. The environment is oxygen depleted one, where the anaerobic flora thrive and produce toxins. Although the sulcus is continuously bathed by the flow of the crevicular fluid, which tends to flush out these microbes or kill them by their antibacterial properties, the bacteria still evade them by their virulence factors and tissue destroying components like Lipopolysaccharide (LPS)[4,5].These

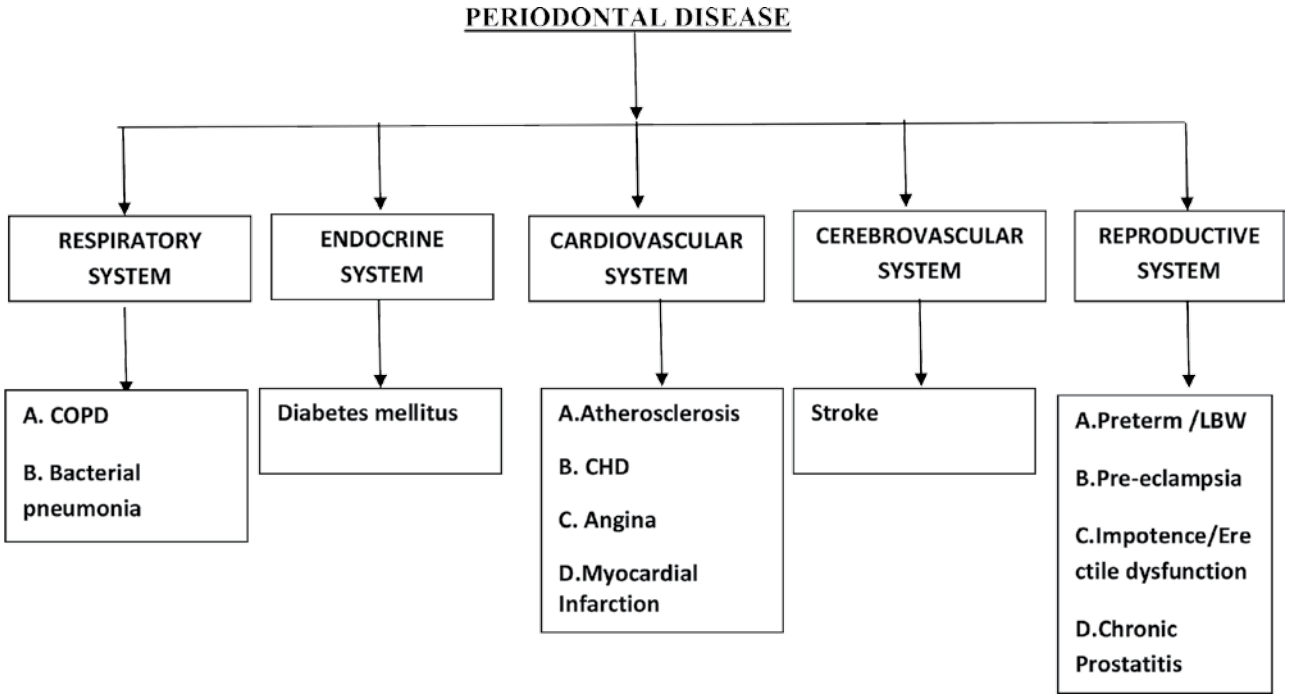
products enter the systemic circulation through a breach in the host defense and evoke a potent inflammatory response. A continued inflammatory response creates a chronic inflammatory state that leads to a cascade of events in a distant site[5].

Focal Infection theory Revisited:

The focal infection theory put forth in 1900's by William Hunter, a British Physician, created a wave amongst the practitioners, as it blamed the oral micro organisms for a wide range of systemic diseases .However, this fame was short-lived as multiple extractions failed to produce the desired level of therapeutic benefit. Recently, the expansions in the field of research in Microbiology and immunology have led to an extensive exchange of knowledge between the dental and medical sciences, thereby evoking a re-interest in the concept of Focal infection[4,5].

Effects of oral diseases on remote sites[1,2]:

Numerous cross-sectional and longitudinal studies have confirmed that periodontal diseases (diseases of investing tissues of teeth) may affect or influence the progression of following conditions:



DIABETES MELLITUS:

The American diabetes Association has included Periodontitis as one amongst the many known complications of this complex metabolic disorder. Recently, it has been termed as the 6th complication of Diabetes (the other five being, Retinopathy, Nephropathy, Neuropathy, Macro vascular disease and Altered wound healing)[6].

The effects of Diabetes Mellitus on oral tissues have been well documented. It is known to magnify periodontal disease, causing multiple abscesses, bone loss, tooth mobility and also increase the rate of dental caries. Moreover, the patients also complain of xerostomia, mucosal drying, burning or cheilosis[6]. Diabetes alters the oral ecoflora, with a predominance of Capnocytophaga, Anaerobic vibrios, and Actinomyces species. In addition, there is a change in Collagen metabolism and Polymorphopnuclear Leukocyte function, all of which are detrimental to the health of periodontal tissues as they make them more susceptible for infections[7].

Recently, it has been suggested that Diabetes and Periodontal disease share a two way relationship[7]. Studies have shown that patients with severe periodontal breakdown have poor glycemic control because of increased insulin resistance and poor penetration of glucose in to the cells. Moreover,

patients who received periodontal therapy exhibited a better control over their blood glucose levels. This improved glycemic control could be attributed to the resolution of chronic inflammatory state which in turn reduced the insulin demand, increased the insulin sensitivity and enhanced the penetration of glucose in to the cells. This emphasizes the importance of control over both these conditions to achieve a good glycemic control[7,8].

PREGNANCY OUTCOME:

Pregnancy ushers in a myriad of changes in the structure and composition of the Periodontal tissues[9]. Changes in the hormonal levels in the first and third trimester increase the susceptibility to infection. Pregnancy associated gingivitis or at times tumor like masses, often referred to as Pregnancy tumors are not uncommon[9].

Another condition of serious concern or rather of utmost clinical significance is Preterm labor or premature rupture of membranes which lead to low birth weight infants. Such infants suffer from poor immunity, infections and other congenital or developmental disorders[9]. There are ample risk factors for the above, stress, smoking, alcohol, diabetes, hypertension, genito-urinary tract infection, to name a few. Bacterial vaginosis is a recognized risk factor for Preterm labor[10]. The bacterial endotoxins may either injure the tissues or stimulate the release of Cytokines- Interleukin 1 &6, TNF-alpha and Prostaglandins prematurely, thereby elevating the levels of the pro-inflammatory mediators in the amnion which predispose them to development of preterm labor[11]. There is a significant correlation between elevated levels of these mediators, fetal death and growth retardation. An intriguing factor is, some studies have isolated Fusobacterium nucleatum, a common oral pathogenic microflora in the amniotic fluid of women who had Preterm labor, while this microbe is relatively scarce in women with or without Bacterial Vaginosis. This suggests a possible haematogenous mode of spread from the oral cavity to the amnion. In addition to the above, elevated levels of well known periodontal pathogens such as Actinobacillus actinomycetem comitans, Porphyromonas gingivalis, Tanerella forsythia, Treponema denticola[11] are noted. Also, treatment aimed at reducing this inflammation has provided beneficial results. Many studies since, have confirmed the association between Preterm Low Birth Weight and Periodontal disease[10].

EFFECTS ON THE CARDIOVASCULAR OR CERBROVASULAR SYSTEMS:

The existence of a chronic inflammatory state created by Periodontal infection pave the way for development of Congestive Heart Disease (CHD). Classic studies of Mattila and coworkers, with exclusion of life style and other risk factors, have drawn parallel between the periodontal disease and severity of atheroma formation. It has been observed that for patients with oral diseases, an overall risk of 19%, and a 44% risk for persons below 65 years, exists for developing CHD[12].

There is an increase in the viscosity of blood and WBC counts in Periodontitis. Again, elevated levels of Von Willebrand factor and fibrinogen levels promote thrombus formation or occlusion of blood vessels, thereby precipitating myocardial ischemia[13]. Also, the bacterial endotoxins seep into the circulation from the oral site and elicit an inflammatory response. The atherosclerotic changes induced by the above factors, elicit narrowing of the coronary arteries leading to myocardial ischemia[13].

Porphyromonas gingivalis and Streptococcus sanguis ,also found commonly in the dental plaque contain Platelet Aggregation Associated Protein (PAAP), which causes binding of the platelets within the vessels promoting thrombus formation. This seems to exert changes in the Blood Pressure, ECG, Heart rate and Cardiac contractility. Acute thromboembolic events could cause serious consequences[14].

The circulating Monocytes or Macrophages enter the inner vessel wall and release Cytokines which promote inflammation. Also, these cells ingest LDL (Low density lipoprotein) and form Foam cells[13]. The vessel wall thickens and narrows with the proliferation of smooth muscle fibers. The rupture of the atheromatous plaque exposes the collagen to the circulating blood, which provoke thrombus formation and furthermore leads to thromboembolic events[15].

Non-Haemorrhagic Stroke also can be precipitated by periodontal disease. An increase in fibrinogen, C-reactive protein, bacteremia, PAAP positive

bacterial strains can cause platelet aggregation and furthermore, the previously mentioned consequences[16].

POSSIBLE EFFECTS ON RESPIRATORY SYSTEM:

Much research is needed in this field to shed light on whether there is indeed any link between oral diseases and COPD[17]. There seems to be no known consensus, as some have reported conflicting data. However, it is imperative to know that dental plaque is a reservoir of Potential Respiratory Pathogens which can be aspirated to Oro-pharynx leading to Pneumonia[18].

EFFECT ON MEN HEALTH:

CHRONIC PROSTATITIS:

A recent research has found that levels of PSA, or Prostate specific antigen secreted by the Prostate in small amounts considerably increase in the chronic inflammatory state generated by Periodontitis and in prostate cancer or chronic prostatitis[19].

IMPOTENCY:

Nothing can be said in particular about this, but it has been observed that prolonged chronic inflammation, like that found in men with periodontal disease, can cause damage to blood vessels which can lead to erectile dysfunction, impotence or affect his sexual health in general (AAP)[20]. Outwardly it seems to be more of a risk factor than an initiating factor, and further research in this area is required.

CONCLUSION:

Numerous literature reviews and an equal number of clinical trials have so far emphasized the role dental diseases play in instigating or magnifying the systemic diseases or in controlling them. Though much more studies are needed before we draw conclusions, still it can be affirmed that periodontal diseases certainly are risk factors for Systemic diseases.

REFERENCES:

1. Mealey BL. Influence of periodontal infections on systemic health. Periodontology 2000. 1999; 21: 197-209.

2. Page RC. The pathobiology of periodontal disease may affect systemic diseases; inversion of a paradigm. Ann Periodontol 1998; 3: 108-120.

3. Seymour GJ, Ford PJ, Cullinan MP, Leishman S, Tamazaki K et al. Relationship between periodontal infections and systemic disease. Clin Microbiol Infect 2007; 13(4): 3-10.

4. Kornman KS. Mapping the pathogenesis of periodontitis: a new look. J Periodontol 2008; 79: 1560-1568.

5. D'Aiuto D, Parkar M, Andreou G, Suvan J, Brett PM, Ready D, Tonnetti MS et al. Periodontitis and systemic inflammation, control of the local infection is associated with a reduction in serum inflammatory markers. J Dent Res 2004; 83: 156-160.

6. Aldridge JP, Lester V, Watts TL, Collins A, Viberti G, Wilson RF et al: Single blind studies of the effects of improved periodontal health on metabolic control in type I diabetes mellitus. J clin Periodontol 1995; 22:271-275.

7. Christgan M, Pallitzsch KD, Schmalz G, Kreiner U, Frenzel S et al: Healing response to non-surgical periodontal therapy in patients with diabetes mellitus, clinical, microbiological and immunological results. J Clin Periodontol 1998; 25: 112-124.

8. Grossi SG, Skrepcinski FB, DeCaro T, Robertson DC, Ho AW, Dunford RG, Genco RJ et al. Treatment of periodontal disease in diabetics reduces glycated hemoglobin. J Periodontol 1997; 68: 713-719.

9. Andrews WW, Hauth JC, Goldenberg RL. Infection and preterm birth. Am J Perinatal 2000; 17:357-365.

10. Boggess KA, Lieff S, Murtha AP, Moss K, Beck J, Offenbacher S et al: Maternal periodontal disease is associated with an increased risk for preeclampsia. Obstet Gynecol 2003; 101: 227-231.

11. Gibbs RS. The relationship between infections and adverse pregnancy outcomes: an overview. Ann Periodontol 2001; 6(1): 153-163.

12. Hujoel PP, drangsholt M, Spiekerman C, DeRouen TA. Periodontal disease and coronary heart disease risk. Perio 2000; 284: 1406-1410.

13. Mattila KJ. Dental infections as a risk factor for acute myocardial infarction. Eur Heart J 1993; 14: 51-53.

14. Drabngsholt MT. A new causal model of dental diseases associated with endocarditis. Ann Periodontol 1998; 3: 184-196.

15. Beck JD, Garcia RG, Heiss G, Vokonas PS, Offenbacher S et al: Periodontal disease and cardiovascular disease. J Periodontol 1996; 67: 1123-1137.

16. Grau AJ, Buggle F, Steichen-Wiehn C, Heindl S, Bannarjee T, Seitz R et al. Clinical and biochemical analysis in infection-associated stroke. Stroke 1995; 26: 1520-1526.

17. Hyman JJ, Reid BC. Cigarette smoking, periodontal disease and chronic obstructive pulmonary disease. J Periodontol 2004; 75: 9-15.

18. Terpenning M. The relationship between infection and chronic respiratory diseases: an overview. Ann Periodontol 2001; 6: 66-70.

19. Nishant Joshi, Nabil F Bissada, Donald Bodner, Gregory T MacLennan, Sena Narendran, Rick Jurevic et al. Association between periodontal disease and prostate specific antigen levels in chronic prostatitis patients. Journal of Periodontology 2010; 81(6):864-869.

20. Periodontal health is important to men too. Perio. org, American academy of Periodontology. Patients page June 2010

Original Article

Role Of Human Papillomavirus (HPV) And Its Detection In Potentially Malignant Disorders And Oral Squamous Cell Carcinomas

Moe Thida Htwe[1], Zaw Moe Thein[2], Swe Swe Win[1]

[1] Department of Oral Medicine, University of Dental Medicine, Yangon

[2] Department of Oral Medicine, University of Dental Medicine, Mandalay

Abstract

Oral malignancy is a major global health problem and more than 90% of these malignancies represent oral squamous cell carcinomas (OSCCs), which are often preceded by pre-existing oral lesions termed as potentially malignant disorders (OPMDs) of the oral mucosa. Although tobacco, alcohol and betel quid chewing habit are well known risk factors for OPMDs and OSCCs, there is evidence to indicate that human papillomavirus (HPV) may also play some inducing role. Human papillomavirus (HPV) infection in OPMDs and OSCCs are controversial. A cross-sectional laboratory based descriptive and analytical study was performed in 62 OPMDs and 62 OSCCs. The presence of HPV infection was detected by Polymerase Chain Reaction (PCR) method. Buccal mucosa was the commonest site for OPMDs [oral leukoplakia (61%) and oral submucous fibrosis (OSMF) (81%)]. In OSCCs, 23% were found in both buccal mucosa and tongue. Betel quid chewing habit was the commonest in OSCC and OSMF (54.8%). HPV positivity was only found in OSCCs about 4.8%. No significant associations were found between HPV infection and histological differentiation of OSCCs as well as grade of epithelial dysplasia for OPMDs. The results suggested that HPV did not play an important role in oral carcinogenesis in this group of Myanmar patients.

INTRODUCTION

Oral malignancy is a major global health problem and it constitutes the sixth most common malignancy. More than 90% represent oral squamous cell carcinoma (OSCC), which are often preceded by pre-existing oral lesions termed as potentially malignant disorders of the oral mucosa such as oral leukoplakia (OL) and oral submucous fibrosis (OSMF) etc. (Warnakulasuriya *et al* 2007, 2011).

According to World Health Organization (WHO), carcinoma of oral cavity in male in developing countries, it is the 6th commonest cancer after lung, prostrate, colorectal, stomach and bladder cancer. In female, it is the 10th commonest cancer after breast, colorectal, lung, stomach, uterus, cervix, ovary, bladder and liver (Landis *et al*., 1999 cited in Mehrotra and Yadav, 2006). Numerous studies have been carried out to investigate the prevalence of HPV in cancer of the oral cavity. Reported estimates have ranged from 0 to 100% (Franceschi *et al.*, 1996; Bouda *et al*., 2000; Gillison and Shah, 2001; Kreimer *et al.*, 2005).

The pathways of HPV transmission in the mucosal lesion may be oro-genital contact by oral sex, more than one sexual partner and prenatal transmission of HPV to the neonatal child (Smith *et al*., 2007).

Prevalence of HPV in Oral Potentially Malignant Disorders

The prevalence of HPV identification in Oral Leukoplakia (OL), Oral Submucous Fibrosis (OSMF) was about 33.8% (D'Costa *et al* 1998). The studies have reported varied results due to the differences in samples and molecular assays utilized, from 0% to 85% (Bouda *et al.,* Campisi *et al*., 2007; Chaudhary *et al*., 2009).

Prevalence of HPV in Oral Squamous cell carcinomas

High-risk HPV are predominantly found in OSCC. HPV was detected in 13.5% of normal mucosa and 26.2% of OSCC (Miller and Johnstone, 2001). Von and Fischer (2007) suggested that the broad spectrum PCR is a reliable method for detection of HPV DNA.

AIM

To detect Human Papillomavirus (HPV) In Potentially Malignant Disorders And Oral Squamous Cell Carcinomas by PCR method

MATERIALS AND METHODS

A cross sectional laboratory-based descriptive and analytical study

PLACE OF STUDY

Department of Oral Medicine, University of Dental Medicine, Yangon

Department of Oral Surgery, University of Dental Medicine, Yangon

Immunology Research Division, Department of Medical Research (Lower Myanmar), Yangon

Department of Oral Medicine and Oral pathology, Medical and Dental University, Okayama, Japan

STUDY POPULATION

Total study population was 124 cases,

62 cases of oral potentially malignant disorders (OL, OSMF) and

62 cases of oral SCCs

METHODOLOGY

Patients were selected according to the selection criteria.

After obtaining the consent from the patients, an oral cancer assessment form was used to collect personal data (name, age, sex, oral habit etc.) from each patient.

All the sections obtained were stained with haematoxylin-eosin stain according to standard procedure.

All the cases diagnosed as oral leukoplakia, oral submucous fibrosis and oral squamous cell carcinoma were carried to laboratories (DMR, Lower Myanmar and Department of Oral Medicine and Oral Pathology, Okayama, Japan) for DNA extraction and HPV detection (high risk and low risk) according to strict molecular laboratory guidelines.

HPV-DNA Detection by PCR

Consensus sequence primer pair within the E6 and E7 open reading frames i.e.

Forward (*pU-1M*)

(5'-TGTCAAAAACCGTTGTGTCC-3')

Reverse *(pU-2R)*

(5'-GAGCTGTCGCTTAATTGCTC-3')

Targeting a region of about 230 bp specific to high and intermediate oncogenic risk HPV (type 16, 18, 31, 33, 35, 52, and 58)

Forward *(pU-31B)*

(5'-TGCTAATTCGGTGCTACCTG-3')

Reverse *(pU-2R)*

(5'-GAGCTGTCGCTTAATTGCTC-3')

Targeting a 228 bp region specific to low risk oncogenic HPV (type 6 and 11) are used to amplify HPV DNA.

RESULTS AND DISCUSSION

DISCUSSION

In Myanmar, many people especially males, extensively used smokeless tobacco in the form of betel quid. Oral habits including tobacco smoking, betel quid chewing as well as combination of both influenced the occurrence of OSCC, OL and OSMF. Betel quid chewing habit was the commonest in OSCC and OSMF (54.8%), 4.8% of OSCC patients had no oral habits. Regarding the histological examination in this present study, most cases of OSCC (83.9%) were well differentiated, (16.1%) were moderately differentiated and there was no poorly differentiated cases.

The relatively high occurrence of mild epithelial dysplasia of OPMDs in this study compare with the other results might be due to the awareness of the

patients as well as early referral from medical and dental professionals. Nowadays, awareness of the patients on oral lesions is increasing and patients are seeking for the treatment at the early stage was also one of the reason. This early presentation might contribute to high incidence of well-differentiated OSCC in this study. Therefore, early recognization plays a vital role in the prevention and early detection of oral cancer. Sixty-two paraffin-embedded tissues specimens for both OPMDs and OSCCs were used for analysis of HPV DNA by PCR. HPV DNA was not detected in oral leukoplakia or oral submucous fibrosis.

HPV DNA was detected 4.8% (3 cases out of 62 cases of OSCCs). Out of 3 HPV DNA positive OSCC cases, 2 cases were associated with betel quid chewing habit and 1 case was without oral habit. It was similar to the large case-control study by Herrero et al., (2003) conducted in 9 countries in Asia, reported as a low prevalence of HPV DNA (3.9%).

Wide range of the rate of detection of HPV DNA could depend on

- the population studied,
- combination of sites of lesions,
- different sampling methods,
- different storage procedures such as fresh frozen or
- formalin fixed paraffin embedded tissue (FFPET),
- technical resources utilized for HPV detection methods (Scully, 2005).

There are problems related to difficulties in the extraction of nucleic acids from FFPETs, especially related to low DNA yield due to DNA degradation and poor DNA quality (Man et al., 2001; Wu et al., 2002; Simonato et al., 2007). DNA was more likely to be detected in fresh-frozen than in paraffin-embedded samples (Chaudhary et al., 2009). The relationship between HPV infection and oral cancer is very low in Myanmar. HPV infection did not play an important role in this study group. However, large population studies are necessary for the role of HPV in OPMDs and OSCCs. It would be interesting to investigate the prevalence of HPV infection in younger patients with OPMDs and OSCCs who do not have any history of smoking and smokeless tobacco, drinking alcohol or betel quid chewing habit.

Figure (1) Distribution of types of lesion by personal habits

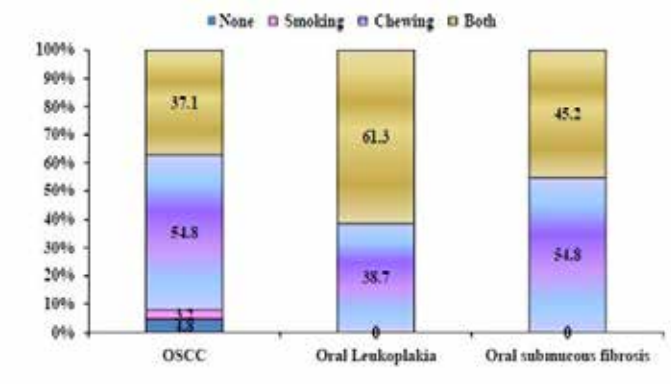
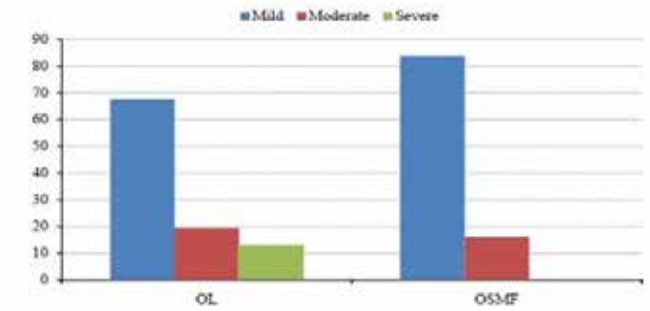
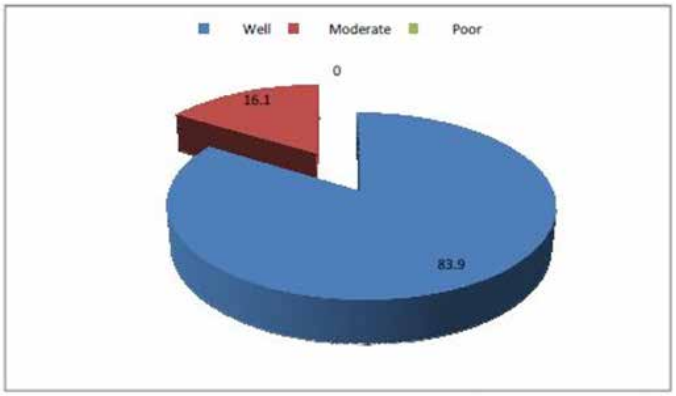


Figure (2) Distribution of grades of epithelial dysplasia in OL, OSMF



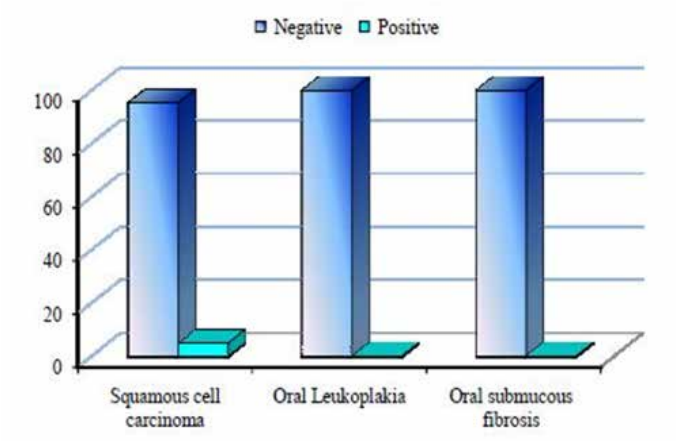
Mild dysplasia was most common 67.7% in OL and 83.9% in OSMF.

Figure (3) Distribution of histological differentiation of Oral Squamous Cell Carcinoma



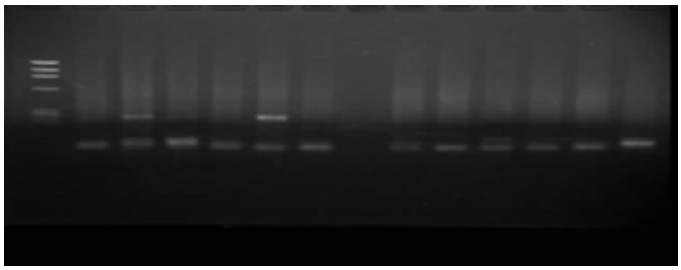
*Well differentiated was most common in OSCC (83.9%)

Figure (4) distribution of HPV positivity in OSCC, Ol, OSMF.



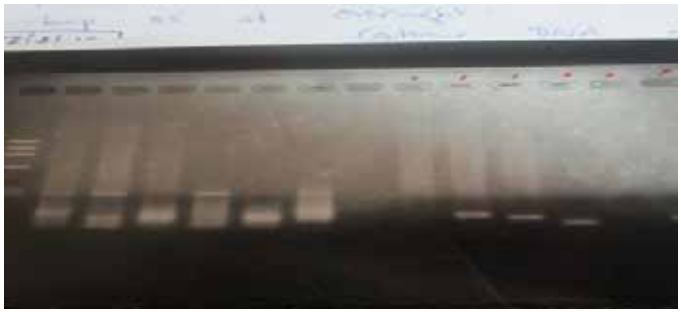
*HPV was only detected in OSCC (4.8%) and was not detected in OL and OSMF

FIGURE (5) Agarose gel electrophoresis of the PCR products for amplification of 230 bp HPV DNA



Lane 1- molecular wt. maker (230 bp),
Lane 2- Negative control,
Lane 3- Positive control,
Lane 6- Positive OSCC case

FIGURE (6) Agarose gel electrophoresis of the PCR products for amplification of 230 bp HPV DNA detection



Lane 1- molecular wt. maker (230 bp),
Lane 2- Positive control,
Lane 4- Negative control,
Lane 3, 5- Positive OSCC case

REFERENCES

- Chaudhary, A. K., Singh, M., Sundaram, S., Mehrotra, R. (2009). Role of human papillomavirus and its detection in potentially malignant and malignant head and neck lesions : updated review. Head and Neck Oncol, 1:22.
- Chow, L. T., Broker, T. R., Steinberg, B. M. (2010). The natural history of human papillomavirus infections of the mucosal epithelia. APMIS, 118: pp. 422-449.
- Herrero, R., Castellsague, X., Pawlita, M., et al. (2003). Human papillomavirus and oral cancer: the International Agency for Research on Cancer multicenter study. J Natl Cancer Inst, 95: pp. 1772-1783.
- Khot, K., Alex, S., Sharma, U. (2011). HPV in Oral Squamous Cell Carcinoma: Where in the Maze? International Journal of Oral & Maxillofacial Pathology, 2: pp. 39-44.
- Kreimer, A. R., Clifford, G. M., Boyle, P., Franceschi, S. (2005). Human papillomavirus types in head and neck squamous cell carcinomas worldwide: a systematic review. Cancer Epidem Biomar, 14(2): pp. 467-475.
- Mehrotra, R and Yadav, S (2006). Oral squamous cell carcinoma: Etiology, pathogenesis and prognostic value of genomic alterations. Indian Journal of Cancer, 43: pp. 60-66.
- Miller, C. S. and Johnstone, B. M. (2001). Human papillomavirus as a risk factor for oral squamous cell carcinoma: A meta-analysis, 1982-1997. Oral Surg Oral Med Oral Pathol; 91: pp. 622-635.
- Warnakulasuriya S., Kovacevic T., Madden P. et al. (2011). Factors predicting malignant transformation in oral potentially malignant disorders among patients accrued over a 10-year period in South East England. Journal of Oral Pathology and Medicine, 40: pp. 677–683.

Original Research

Epidemiological and Clinico-pathological study of 120 cases of Oral Cancers in Myanmar 2012

Myo Min Thane[1,2], Le Le Win[1], Swe Swe Win[1,2]

1. ACTION Study Group, Department of Medical Research (Lower Myanmar)
2. University of Dental Medicine, Yangon.

Abstract

Oral cancer is the fifth most common cancer in ASEAN. Myanmar involves in high risk countries where betel quid chewing and smoking habits are very common and are strongly related to oral cancer. The objective of this study is to determine the epidemiological and clinic-pathological characteristics of oral cancer. In this study, 120 patients diagnosed with oral cancer from University of Dental Medicine, Yangon and Department of Plastic, Oral and Maxillofacial Surgery, Yangon General Hospital from January 2012 to September 2012, were included. Epidemiological characteristics, clinical characteristics, and histopathological descriptions were recorded by using ACTION Study questionnaires forms and WHO Oral Cancer Assessment forms. Male-female ratio was 1.6:1. The commonest age group was 46-65 years (54.17%) and the most frequent occupations were non-skilled workers (29.67%) and followed by agricultural, forestry and fishery trades and workers (26.67%). Only betel quid chewer were 28.33% and those with both betel quid chewing and smoking habits were 17.5% and only smoking were 15.83% respectively. Most of the patients chewed betel quid with tobacco which were 74.68%. Squamous cell carcinoma comprised 77.5% of all oral cancers and buccal mucosa was the most affected site (33.33%) and the patient with stage IV were 60%. Oral squamous cell carcinomas were predominant and betel quid chewing and smoking were found to be high risk. According to their habitual pattern, buccal mucosa was the commonest site and most of the oral cancer cases represented with advanced stage was due to delay referral.

Keywords : Oral Cancer-Myanmar, epidemiological, clinic-pathological

Introduction

Oral cancer is the sixth most common cancer in the world and fifth most common cancer in ASEAN (Ferlay et al 2004, Merral et al 2012). In South Asian and East Asian countries, oral cancer contributes up to 50% of all new cases of cancer. In Indian males, oral cancer is the first most common cancer. In Sri Lanka, oral cancer ranked first in five most common cancers (Khandekar et al 2006). Myanmar involves in high risk countries in South East Asia and ranked 6th position in males and 10th position in females among all types of cancers. It is commonly related to tobacco habits (Oo et al 2011). In Myanmar, the occurrence of oral cancer is not clearly known where betel quid chewing habits are widely spread. The purpose of the study is to determine the epidemiological and clinico-pathological characteristics of oral cancer.

Patients and Method

After obtaining the informed consent, 120 patients diagnosed with oral cancer attending at University of Dental Medicine, Yangon and Department of Plastic, Oral and Maxillofacial Surgery, Yangon General Hospital from January 2012 to September 2012, who recruited for Asean Costs In Oncology Study – Myanmar, were included. Patients who were 18 years and above, with first time cancer diagnosis and willing to participate in the baseline and two follow-up interviews were selected. Epidemiologic characteristics, clinical characteristics and histopathological descriptions were recorded according to WHO Oral Cancer Assessment forms

and ACTION Study questionnaires forms.

Results

Males were more affected than females (1.55:1). (Fig. 1).Education level of the patients were middle and high school level (49.17% (Fig.2.) and most were non-skill workers (29.67%). (Fig.4). Overall tobacco users including smoking and chewing were 84.9%. Over half of the patients had poor oral hygiene (59.17%). Squamous cell carcinoma comprised 77.5% of all oral cancers (Fig.6) and buccal mucosa was the most affected site (33.33%).(Fig.7,7A-D). Patients represented with stage IV oral cancer were 60% (Fig.8). In grading of oral squamous cell carcinomas, 83.9% were well differentiated (Fig.9).

Figure.1. Distribution of oral cancer by age group and sex

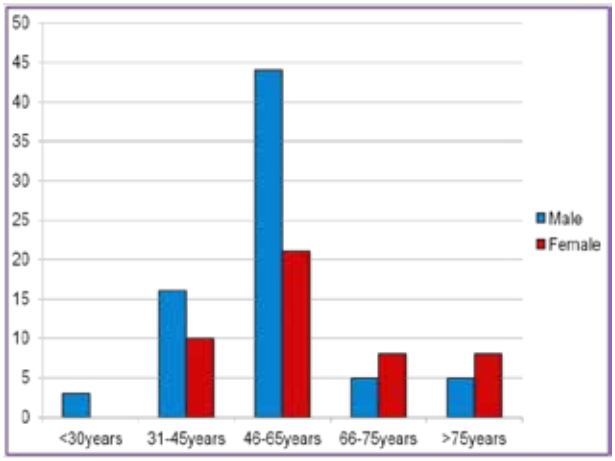


Figure.2. Education level of patient by sex

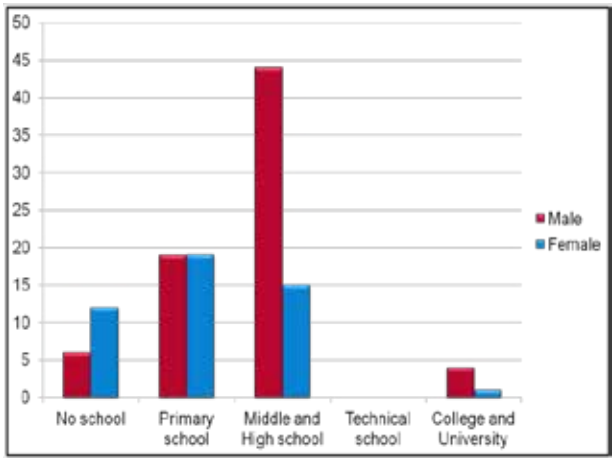


Figure.3. Distribution by race and ethnicity

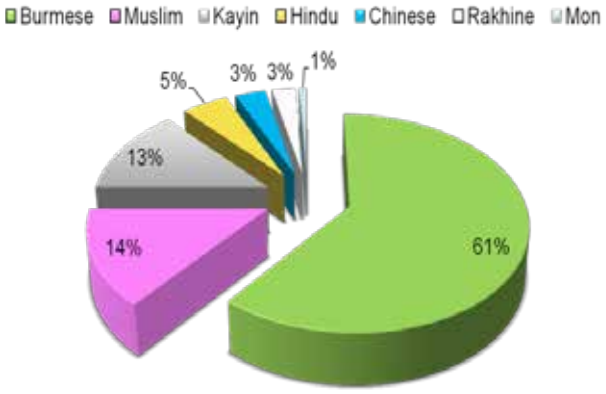


Figure.4. Occupation of patients

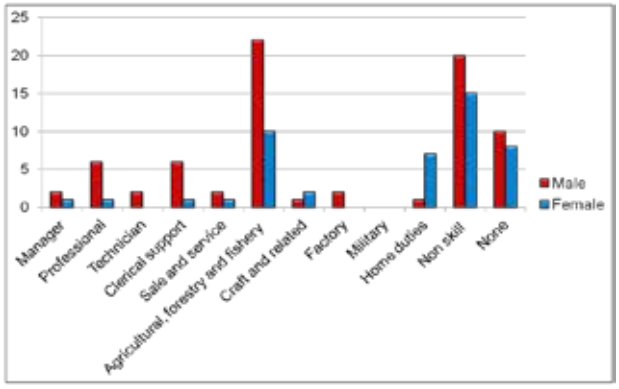


Figure.5. Oral habits of patients

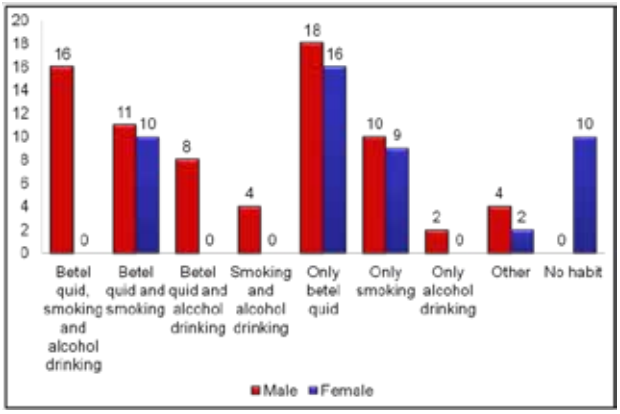


Figure.6. Histopathological descriptions of oral cancer

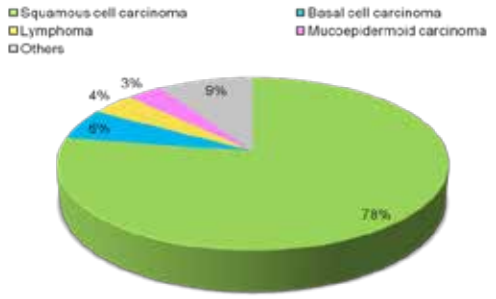


Figure.7. Site distribution of oral cancer

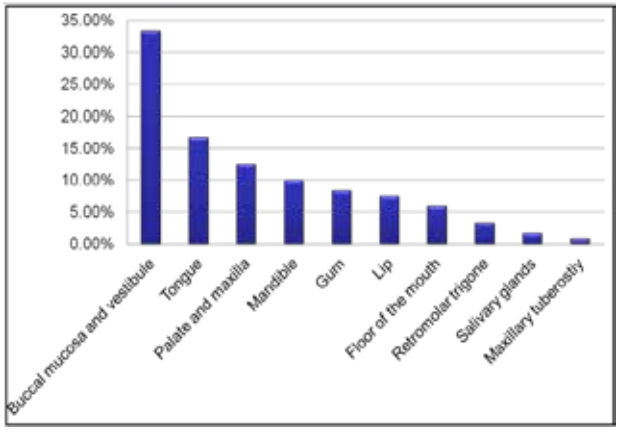


Figure.8. Percentage of staging

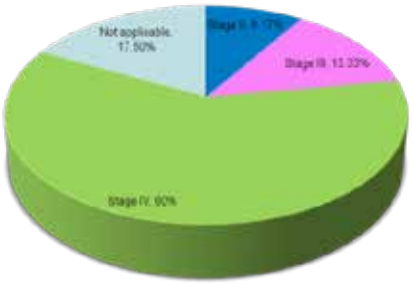


Figure.9. Percentage of grading of squamous cell carcinoma

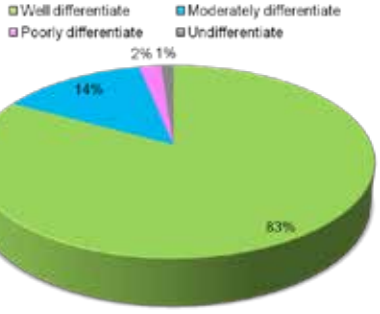


Figure.5A. Smokeless tobacco

Figure.5B. Tobacco smoke-cheroots and cigarettes

Clinical presentations of oral cancers

Conclusion and Recommendation

Oral squamous cell carcinomas were predominant type and tobacco related oral habits were found to be high risk. According to the results, buccal mucosa was the commonest site and most of the oral cancer cases were represented with advanced stage. Therefore, strategies for primary prevention, oral health promotion and health education programs related to oral cancer and early detection should be encouraged.

Acknowledgements

We wish to gratefully acknowledge ASEAN Foundation for funding and George Institute for Global Health, Australia for the technical support. We are also deeply thankful to Departments Of Oral and Maxillofacial Surgery from University of Dental Medicine and Yangon General Hospital. Finally our grateful thank to all patients participated in this study, this study will not be possible without their participations.

References

1. Ferlay J, Pisani P, Parkin DM. GLOBOCAN 2002. Cancer incidence, mortality and prevalence worldwide. IARC Cancer Base (2002 estimates). Lyon: IARC Press; 2004.

2. Khandekar S P, Bagdey P S, Tiwari R R. Indian Journal of Community Medicine 31-33: July - September, 2006.

3. Kimman M, Norman R, Jan S, Kingston D, Woodward M. The Burden of Cancer in Member Countries of the Association of Southeast Asian Nations (ASEAN). Asian Pacific J Cancer Prev, 13: 411-420, 2012.

4. Oo HN, Myint YY, Maung CN, Oo PS, Cheng J, Maruyama S, Yamazaki M, Yagi M, Sawair FA, Saku T. Oral cancer in Myanmar: a preliminary survey based on hospital-

based cancer registries. J Oral Pathol Med 40: 20-26, 2011.

5. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. Oral Oncol;45:309-316,2009.

For correspondence :

Dr. Myomin Thane

Email – myominthane@yahoo.com

Original Research

A new peripheral tracing material for mandibular complete denture impression

Aung Thu Hein[1], Myat Nyan[1], Than Swe[1], Thein Kyu[2]

[1] Department of Prosthodontics, University of Dental Medicine, Yangon
[2] Rector, University of Dental Medicine, Yangon

Abstract

Success of complete dentures largely depends on accuracy of impression. In fabrication of mandibular complete denture, border molding of an individual tray is an essential step in impression making. It can also trace the future denture's periphery by molding the peripheral of the individual tray and by asking the patient to make functional trimming exercises. The individual tray obtained from a preliminary impression are border molded with modeling compound, and final impression is completed with easily flowable impression material such as zincoxide eugenol paste. By using this border molding and peripheral tracing impression technique, resultant mandibular complete denture favors good retention and stability even in resorbed alveolar ridge. Most prosthodontists accepted this method as a standardized method for complete denture construction. But it is time consuming and often difficult for beginners to master as it require skill and experience. In this study, high viscosity silicone (putty) and light body silicone have been introduced as a new border molding material. It was found that the retention of two base plates resulted from impression making with these two border molding materials were not statistically significant (mean 367 gf for compound and 368 gf for silicone). Silicone impression material has an excellent elasticity and acceptable working time in the mouth during functional trimming. It also has good dimensional stability, acceptable taste and ease of manipulation for every dentist.

Introduction: Success of complete dentures largely depends on accuracy of impression (Hayakawa, 2003). Making accurate final impression for complete dentures is a multistage process that involves a preliminary impression, a final specialized or individualized final impression tray and a final border impression (Heartwell, 1986 and Zarb, 1990). In fabrication of mandibular complete denture, peripheral tracing with tracing compound of an individual tray is an essential step in impression making (Levin, 1984 and Zarb *et. al*., 1997). Most prosthodontists accepted this method as a standardized method for complete denture construction. But it is time consuming and often difficult for beginners to master as it require skill and experience (Hayakawa, 2003). Silicone impression material has excellent elasticity, acceptable working time, good dimensional stability, acceptable taste and ease of manipulation for every dentist. The purpose of this study was to compare the retentive forces of two mandibular base plates this fabricated from two peripheral tracing impression materials, compound and silicone.

Material and Methods: The primary impression was made with impression compound (Hiflex Impression Compound) then constructed the acrylic close fitting special tray and molded along the periphery with tracing compound for standard technique and heavy-bodied silicone (Speedax, coltene, whaledent) for research technique. Final impression was made with zincoxide eugenol (Synident Zincogenol) for compound tracing and light bodied silicone for silicone tracing. The two base plates were constructed for each technique in a patient. Retentive forces of these two base plates were measured in the patient's mouth by using push-pull gauge. Statistical comparison of test results was performed by using t-test.

Figure 1 and 2. Peripheral Tracing with tracing compound

Figure 3. Peripheral Tracing with silicone

Figure 4. Clinical Procedure

Figure 5. Base plate constructed from impressions

Results: Retention values of two base plates fabricated from the casts obtained from two impression materials, (mean 367 gf for compound, standard technique and 368 gf for silicone) were not significant.

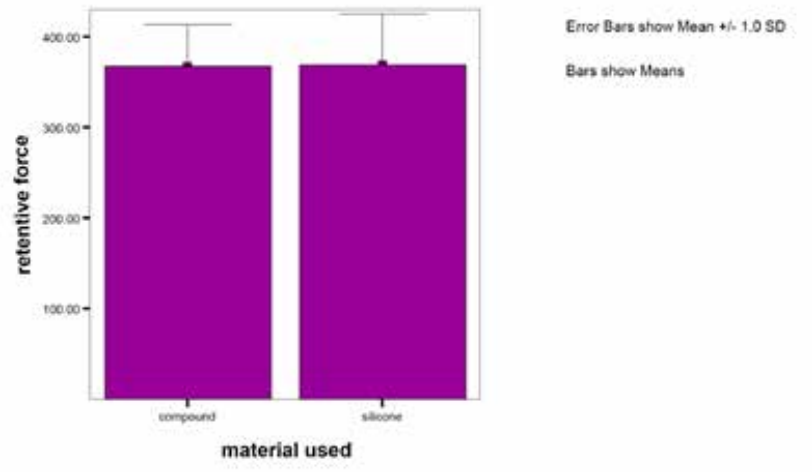


Figure 6. Comparison of retentive forces of two base plates which obtained from different materials

Table 1. Statistical Analysis

T-Test

Group Statistics

	material used	N	Mean	Std. Deviation	Std. Error Mean
retentive force	compound	10	367.0000	45.71652	14.45683
	silicone	10	368.0000	56.72546	17.93817

Independent Samples Test

Discussion: Border molding impression trays by modeling plastic has been used since 1907 (Sanjeev, 2012). Around 1950, border molding with tracing compound was accepted as standardized technique by most prosthodontists (Craddock, 1951). Various surveys showed modeling plastic impression compound and zincoxide eugenol impression paste is most popular material used for complete denture impression. But there is distinct trend for increasing use of polyvinyl siloxane and polyether for border molding procedures and impression of edentulous arches. In literature, various author reported the use of elastomer for border molding and final impression. Woelfel *et. al*., (1963) reported that it required an average of 17 placements to obtained a maxillary final impression using modeling compound as the border molding material. It became the major drawback of this technique. Smith *et. al*., (1979) described a technique using a polyether impression material for border molding the final impression trays. The major advantages of this technique were that the border molding could be accomplished in one-step and the patient's functional movements were utilized to form the borders. Tan *et. al.*, (1996) concluded that polyether impression material required less time to complete the border molding process, border recorded were longer and less operator variability when compared with modeling compound. Lu *et. al*., (2004) and Appelbaum *et. al*., (1984) concluded that polyvinyl siloxane putty and light body impression material are well suited for making complete denture impression. Good results are obtained with less expenditure of time as well as less discomfort and inconvenience for the patient, especially in the hands of an inexperienced operator.

Using silicone as a peripheral tracing impression material was first introduced by Smith (1979). It has the advantages of simultaneous molding of all borders with one insertion of the tray, easy technique, patient's comfort and good dimensional stability (Rizk, 2008). Additional superior advantages to the standardized compound tracing technique were uniform consistency and accurate reproduction of undercut areas. This study compared the retention of two denture base plates obtained from tracing compound with zincoxide eugenol and silicone putty with light body wash. It was found that both retentions were satisfactory and no statistically significant difference between two materials. Because of its advantages, silicone are definitely going to replace the traditional impression materials.

Conclusion: Silicone may applicable as peripheral tracing impression material in complete denture construction alternative to the standardized technique with tracing compound.

References

Appelbaum, E.M., Mehra, R.V., (1984). Clinical evaluation of polyvinyl siloxane for complete denture impression. *J Prosthet Dent*, 52, pp. 537-539.

Craddock, F.W., (1951). *Prosthetic dentistry; a clinical outline*. St. Louis: CV Mosby.

Hayakawa, I., (2003). *Impression for complete dentures using silicone impression materials*. Quintessence Int, 34, pp. 177-180.

Levin, B., (1984). *Impression for Complete Dentures*. Chicago: Quintessence.

Lu, H., Nguyen, B., Powers, J.M., (2004). Mechanical properties of 3 hydrophilic addition silicone and polyether elastomeric impression materials. *J Prosthet Dent*, 92, pp. 151-154.

Rizk, F., (2008). Effect of different border molding materials on complete denture retention. *Cairo Dental Journal*. 3, pp. 415-420.

Sanjeev, M., (2012). Single step silicone border molding technique for edentulous impression. *Int J of Clinical Cases and Investigations*. 4(2), pp. 85-90.

Smith, D., (1979). One-step border molding of complete denture impressions using a polyether impression material. *J Prosthet Dent*. 41, p. 347.

Tan, H.K., Hooper, P.M., Baergen, C.G., (1996). Variability in the shape of maxillary vestibular impression recorded with modeling plastic and a polyether impression material. *Int J Prosthodont*, 9, pp. 282-289.

Woelfel, J.B., (1963). Contour variations in one patient's impression made by seven dentists. *J Am Dent Assoc*, 67, pp. 1-9.

Zarb,G.A.; Bolender, C.L. and Carlsson, G.E., (1997). *Boucher's Prosthodontic Treatment for Edentulous Patients*. 11th Edition. St. Louis: CV Mosby.

Original Research

Effect of mixing methods and disinfection on dimensional accuracy of alginate impression

Thida Phyo[1] and Myat Nyan[2]

[1] Private practitioner, Sakura Dental Implant Centre, Yangon, Myanmar.
[2] Department of Prosthodontics, University of Dental Medicine, Yangon, Myanmar.

Abstract:

Commercial mechanical mixers for mixing alginate impression materials are available in Myanmar dental market and they are more convenient and more consistent for the practitioner; however, there is very little information on the mechanical property of alginate mixed with device as compared with hand-mixing. Moreover, there is limited knowledge on dimensional changes after disinfection of auto-mixed alginates. This study was performed to study the dimensional accuracy of alginate impressions mixed by different methods with or without soaking in disinfection solution.

Commercially available alginate impression material (Kromopan, Lascod, Italy) was mixed by mechanical mixer (DB-988+, Coxo Medical Instrument Co. Ltd.) or hand-mixed according to manufacturer's recommended water powder ratio. Metal impression tray of appropriate size was loaded with mixed impression material and impression was made on plastic typodont model. Then after washing under running water, they were soaked in 0.5 % sodium hypochlorite solution for 10 minutes and then rinsed under running for 1 minute (disinfection, n=10) or cast immediately (control, n=10). Impressions were cast with dental stone (Fuji Rock, GC Co. Ltd., Tokyo, Japan). Tooth length and saddle length were measured with digital slide clipper. Unpaired T test was employed to analyze data.

Significant differences were found between auto-mixed and hand-mixed samples and between control and disinfection samples. Automatic mixing with disinfection gave casts that were the closest representation of actual model.

Automatic mixing and subsequent disinfection by soaking in 0.5% sodium hypochlorite solution is preferred for more accurate alginate impressions.

Introduction

Anatomical models are used for many diagnostic and treatment purposes in the dental practice. A dimensionally accurate impression, i.e. a negative mould of the jaw, is important for fabricating a precise anatomical model. The most commonly used impression material is alginate, irreversible hydrocolloid material. Alginates were originally developed in the 1930s (Doubleday, 1998). The main advantages of alginates are the ease of use, cost-effectiveness, their hydrophilic characteristics, and the good patient acceptability (Frey *et al.*, 2005). Although alginate is easy to manipulate, the correct handling (water/powder ratio, spatulation) affects dimensional accuracy of the material. Therefore, it is imperative to follow the manufacturer's prescriptions on mixing (Caswell *et al.*, 1986; Frey *et al.*, 2005).

Nowadays, high-speed rotary mixing instruments for alginate impression materials are available to be used in a dental practice. These instruments easily produce a fine paste low in air bubbles compared with paste mixed by hand. Therefore, it is estimated that paste obtained by this method possesses superior rheological properties by reducing the number and volume of porosities in the mixed alginate (Inoue *et al.*, 2002).

In addition, dental impressions become contaminated with the microorganisms from saliva and blood of the patients that can cross-infect gypsum casts poured against them (Chau *et al.*, 1995). This potential of cross-contamination between clinical

area and laboratory must be reduced (Sofou *et al.*, 2002). Sterilization of impressions by dry or moist heat is unsuitable for alginates and therefore cold disinfection must be used for this purpose (Conner, 1991). As the necessity for disinfecting impressions has become apparent, it has also become clear that the process itself should have no adverse impact on the dimensional accuracy and surface texture features of the impression material and resultant gypsum cast (Ahmad *et al.*, 2007). The ideal disinfection procedure must leave the physical and chemical properties of the impression material and gypsum unchanged to achieve optimal accuracy of the final casts and the appliances made on the casts.

The aim of this study was to quantify the effect of hand-mixing and automatic mixing technique with or without the use of a disinfectant on dimensional accuracy of alginate impression.

Materials and Methods

A partially edentulous typodont model (Figure 1) was used to take the impression with alginate impression material. Commercially available alginate impression material (Kromopan, Lascod, Italy) was mixed by mechanical mixer (DB-988+, Coxo Medical Instrument Co. Ltd.) (Figure 2) or hand-mixed according to manufacturer's recommended water powder ratio. Metal impression tray of appropriate size was loaded with mixed impression material and impression was made on plastic model. Then after washing under running water, they were soaked in 0.5 % sodium hypochlorite solution for 10 minutes and then rinsed under running for 1 minute (disinfection, n=10) or cast immediately (control, n=10). Impressions were cast with dental stone (Fuji Rock, GC Co. Ltd., Tokyo, Japan).

Six measurements were done for each cast sample by measuring teeth lengths (anterior, premolar, molar) and lengths of edentulous spans (anterior, premolar and molar regions) by using a digital slide clipper (Figure 3). Measured data was registered in spreadsheet program (Microsoft Excel, Version 2007) and examined by using 'Unpaired Samples T test' in SPSS (Statistical Package for Social Science) statistical software. The values of change between measurements from sample casts and measurements directly taken from the typodont model were calculated and expressed as a linear change in millimeter (mm).

Figure (1) Partially edentulous typodont model

Figure (2) DB-988 Alginate mixer

Figure (3) Digital slide clipper

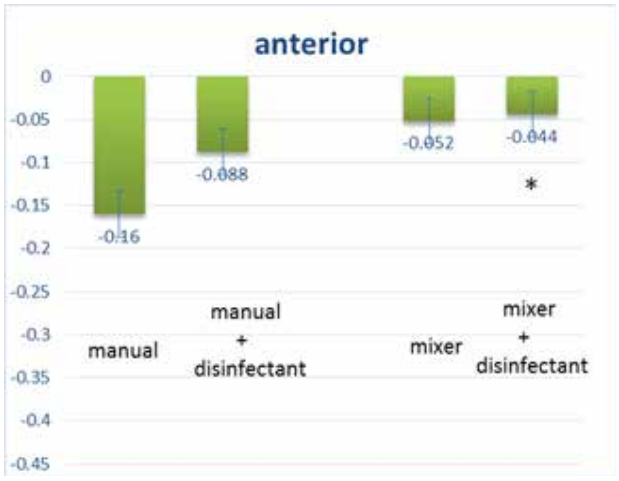
Result

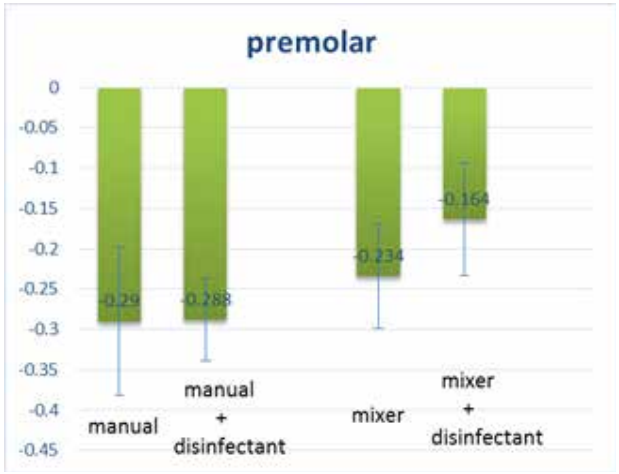
Table (1) Measurements of typodont model and sample casts (hand-mixing method)

Measurements	Typodont model			Sample casts without subsequent disinfection			Sample casts with subsequent disinfection		
	Anterior	Premolar	Molar	Anterior Mean (SD)	Premolar Mean (SD)	Molar Mean (SD)	Anterior Mean (SD)	Premolar Mean (SD)	Molar Mean (SD)
Tooth length	11.13	8.8	6.62	10.97 (0.07874)	8.51 (0.091378)	6.376 (0.013416)	11.042 (0.034205)	8.512 (0.050695)	6.496 (0.082037)
Edentulous span length	9.08	14.28	16.63	9.108 (0.027749)	14.372 (0.099348)	16.762 (0.076616)	9.184 (0.074027)	14.55 (0.082765)	16.828 (0.112561)

Table (2) Measurements of typodont model and sample casts (automatic mixing method)

Measurements	Typodont model			Sample casts without subsequent disinfection			Sample casts with subsequent disinfection		
	Anterior	Premolar	Molar	Anterior Mean (SD)	Premolar Mean (SD)	Molar Mean (SD)	Anterior Mean (SD)	Premolar Mean (SD)	Molar Mean (SD)
Tooth length	11.13	8.8	6.62	11.078 (0.040866)	8.566 (0.065038)	6.518 (0.072595)	11.086 (0.06269)	8.636 (0.069857)	6.596 (0.02881)
Edentulous span length	9.08	14.28	16.63	9.078 (0.034928)	14.332 (0.042661)	16.726 (0.078613)	9.152 (0.056303)	14.476 (0.086776)	16.8 (0.091924)





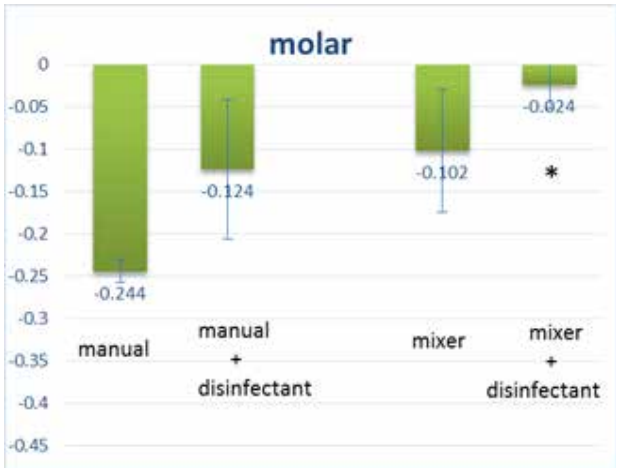
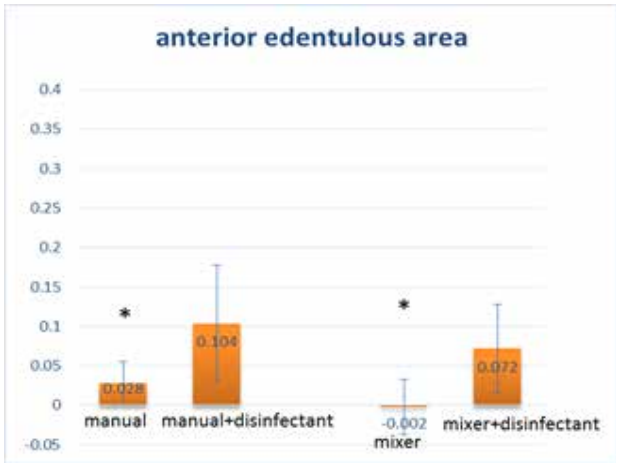
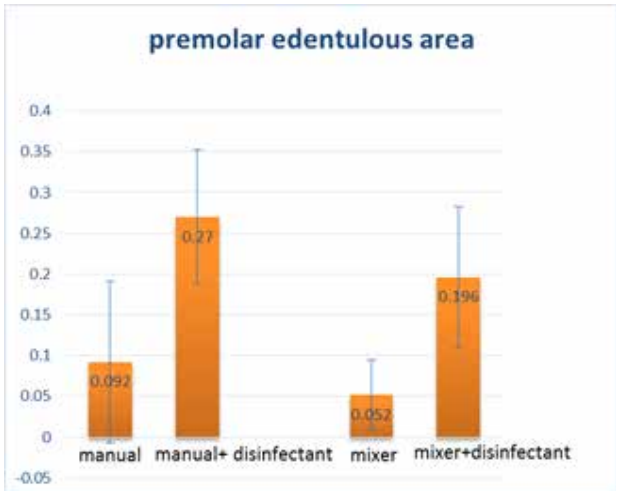


Figure (4) The amount of change of tooth length in the sample casts with or without subsequent disinfection. Error bars denote standard deviation. *p<0.05 represents statistically significant differences.





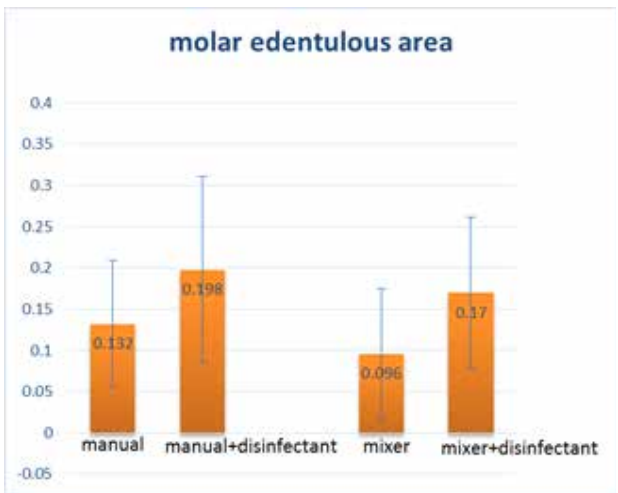


Figure (5) The amount of change of edentulous span length in the sample casts with or without subsequent disinfection. Error bars denote standard deviation. *p<0.05 represents statistically significant differences.

Tooth length of all sample casts became shorter than that of typodont model (maximum 0.29 mm). Significant differences were found at anterior and molar tooth length of auto-mixed samples with subsequent disinfection.

Nevertheless, edentulous span of all samples was longer than that of actual model (maximum 0.27 mm). Although significant differences were seen at anterior of both auto-mixed and hand-mixed samples without subsequent disinfection, there were no significant differences in the samples with subsequent disinfection.

Discussion

The statistical analysis showed that significant differences were found in cast dimension and tooth lengths between two mixing methods with or without disinfection. Alginate impressions prepared with automatic mixing method have better dimensional accuracy than those mixed by hand. Koski showed that alginate mixed with the device produced fewer surface defects and had better detail reproduction with cast gypsum than hand-mixing (Koski, 1997). Inoue et al. (2002) investigated the setting characteristics and rheological properties of alginate mixed by three methods: a hand-mixing technique, a semi-automatic mixing instrument, and an auto-mixed instrument. They found almost no porosities using the auto-mixed instrument and concluded that in clinical use, homogenous mix produced by auto-mixed is preferred over hand mixing (Inoue et al., 2002). Frey et al. (2005) used the Alginator II (Cadco, Oxnard, CA), a semi-automatic mixer and observed similar findings.

However, it is noted that the working time of automatically mixed paste was significantly decreased. It may be because when the material is mixed at high speed, the temperature of the paste increases slightly due to friction between the material and mixing container. Similarly Inoue *et al.* (2002) showed that pastes mixed automatically had a markedly shorter working and setting time compared with hand-mixing. Disinfection of impressions has been taken for a topic of importance for a number of years. American Dental Association (1994) recommended a ten-minute immersion in a 1:10 dilution (0.525%) of sodium hypochlorite solution for disinfection of hydrocolloid impressions. So, 0.5% sodium hypochlorite solution was chosen as a disinfectant in our study. It has strong and immediate antimicrobial effect, cost effectiveness and is easily available in the market. Alginate impressions do not tolerate the heat treatment; therefore chemical disinfection has been the method of choice (Ahmad et al., 2007). Immersion seems to be more secure than spraying (Kotsiomiti et al., 2008). As irreversible hydrocolloid has a tendency to be superficially dissolved in sodium hypochlorite, hydrocolloids should be disinfected for a limited time (Dreesen et al., 2012).

In the present study, there was contradictory result regarding the effect of disinfection. Although disinfection gave casts with teeth that were the closest representation of actual model than without disinfection (especially with auto-mixing), for edentulous span length disinfection showed negative effect i.e. the span became longer than those without disinfection. Nevertheless, auto-mixing without disinfection resulted in the casts with the least change in edentulous span length. It is assumed that alginate materials prepared with manual method produce more porosity and more absorption of water (imbibition) can affect the precision of the impression and may result in inaccurate casts. Although the differences between the mixing methods with or without disinfection are found to be significant, the preference for device mixing is not only to standardize the alginate mixing procedure but also to facilitate the mixing, to reduce the amount of air bubbles, to obtain a homogenous mixture (Dreesen K et al., 2012).

Conclusion

Within the limitation of the present study, it can be concluded that auto-mixing is preferable for more accurate alginate impression and subsequent disinfection with 0.5% sodium hypochlorite solution for 10 minutes has little effect on dimensional accuracy.

References

Ahmad S, Tredwin C J, Nesbit M, Moles D R 2007 Effect of immersion disinfection with Perform-ID on alginate, an alginate alternative, an addition-cured silicone and resultant type 3 gypsum casts

Caswell C W, von Gonten A S, Meng T R 1986 Volumetric proportioning techniques for irreversible hydrocolloids: a comparative study. Journal of American Dental Association 112:859-861

Chau V B, Saunders T R, Pimsler M, Elfring D R 1995 In depth disinfection of acrylic resins. Journal of Prosthetic Dentistry 74:309-313

Conner C 1991 Cross-contamination control in prosthodontic practice. Journal of Prosthetic Dentistry 4: 337-344

Dreesen K, Kellens A, Weavers M, Pushpike JT, Willems G. The influence of mixing methods and disinfectant on the physical properties of alginate impression material. Eur J Orthod 2012; 10:1-7

Doubleday D 1998 Orthodontic products update. British Journal Orthodontics 25: 133-140

Frey G, Lu H, Powers J 2005 Effect of mixing methods on mechanical properties of alginate impression materials. Journal of Prosthodontics 14: 221-225

Inoue K, Song Y X, Kamiunten O, Oku J, Terao T, Fuji K 2002 Effect of mixing methods on rheological properties of alginate impression materials. Journal of Oral Rehabilitation 29: 615-619

Kotsiomiti E, Tzialla A, Hatjivasiliou K 2008 Accuracy and stability of impression materials subjected to chemical disinfection-a literature review. Journal of Rehabilitation 35:291-299

Sofou A, Larsen T, Fiehn N E, Owall B 2002 Contamination level of alginate impression arriving at a dental laboratory. Clinical Oral Investigation 6: 161-165

Original Research

An in vitro study on coronal microleakage of endodontic acess cavity using single seal and double seal techniques

Phyu Phyu Aung[1], Aung Thein Tun[2], Myint Myint San[2], Aung Htang[1]

[1] Department of Conservative Dentistry, University of Dental Medicine, Mandalay
[2] Department of Conservative Dentistry, University of Dental Mendicine, Yangon

Abstract

The purpose of this study was to compare the sealing ability of the two temporary restorative materials: Caviton and Kalzinol, and to compare the sealing ability of single and double sealing technique. Endodontic access cavities were prepared in eighty extracted human mandibular molar teeth. They were divided into 4 groups. In group (I) – the access cavities were restored with Caviton alone, in group (II) – the access cavities were restored with Kalzinole alone, in group (III) – 2 mm of gutta-percha temporary stopping was placed as an underlying material within the pulp chamber and then Caviton was placed as the external material, in group (IV) - 2 mm of gutta-percha temporary stopping was within the pulp chamber and then Kalzinol was placed as the external material.

After restoring the access cavities, the teeth were immersed in 2% methylene blue dye solution for 2 days and 7 days intervals. Then, they were split into halves mesiodistally, and the dye penetration was assessed by using magnifying glass at magnification of x3. The data were subjected to stastical analysis by using SPSS software version 16, using Kruskal-Wallis test, Mann-Whitney test and Tukey HSD test. According to the result, Caviton provided better sealing ability than that of Kalzinol in both immersion periods, and there is no significant difference between single sealing technique and double sealing technique.

Introduction

Root canal treatment can be carried out in a single visit or multiple visits. Mostly, single visit root canal therapy is carried out for vital, non-infected cases. Whilst multiple visit root canal therapy is indicated for cases with infected canals. Therefore, complete sealing of the endodontic access opening between appointments is an essential element to achieve endodontic success.

Many clinical cases with infected canals require dressing with antibacterial medicaments in a multivisit treatment in which effective temporization for different periods of time becomes mandatory (Sjögrene, *et. al.,* 1997). Temporary restorative materials must provide an adequate seal against ingress of bacteria, fluids and organic materials from the oral cavity to the root-canal system, and at the same time prevent seepage of intracanal medicaments.

Nowadays, a wide variety of temporary restorative materials is available to the profession. They are usually grouped based on their prime constituents such as (1) Zinc oxide containing cements: Zinc phosphate cement, Zinc polycarboxylate cement, conventional Zinc oxide eugenol cement, reinforced Zinc oxide eugenol cement (IRM and Kalzinol etc), Zinc oxide and calcium sulphate preparation (Caviton and Cavit, etc), (2) Glass ionomer cement and (3) Light cured composite material formulated as temporary endodontic restorative material (TERM).

In the present *in vitro* study, Caviton and Kalzinol were selected to compare the microleakage of single seal technique and double seal technique in endodontic access cavity.

Materials and Methods

Eighty extracted human mandibular molars with no carious lesion, small and moderately extent class I carious lesion were collected from Department of Oral and Maxillofacial Surgery, University of Dental Medicine, Yangon and Out Patient Department of Thingankyun Sanpya, Hospital. During the period of sample collection, the teeth were stored in 10% formalin solution. After completing the collection, the teeth were thoroughly washed under running tap water and immersed in 5% sodium hypochlorite solution for disinfection and removing soft tissues adhered to the root surface. The hard deposits on the tooth surface were removed with hand scaler.

All the teeth were randomly divided into four experimental groups and each group contained twenty teeth. The access cavities of each group were prepared, and restored as follow-

Group I - all the teeth were restored with Caviton alone

Group II - all the teeth were restored with Kalzinol alone

Group III - all the teeth were restored with gutta - percha temporary stopping and Caviton

Group IV- all the teeth were restored with gutta - percha temporary stopping and Kalzinol.

After the placement of the temporary restorative materials into the prepared access cavities, the radiographs of all specimens were taken to verify the quality of coronal temporary restoration (figure 1).

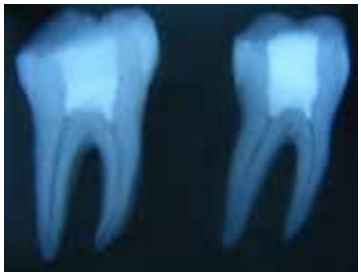


Figure 1. radiographic representations of coronal temporary restoration

For complete setting, all the specimens were placed in distilled water at 37˚C for 48 hours. After 48 hours, all the specimens were taken out and allowed to air dry. Then the specimens were coated with double layers of nail varnish to all surfaces expect 1mm around the restorative margin. The first layer of nail varnish was allowed to dry thoroughly before applying second layer. After that all the specimens were coated with melted modelling wax in same manner as nail varnish was applied.Then all the specimens were immersed in methylene blue dye solution for 2 days and 7 days intervals (figure 2).

Figure 2. Specimens were immersed in methylene blue dye solution

Table 1. Experimental groups for 2 days interval

Groups	Materials	Teeth
I	Caviton	10
II	Kalzinol	10
III	Caviton and gutta-percha	10
IV	Kalzinol and gutta-percha	10

Table 2. Experimental groups for 7 days interval

Groups	Materials	Teeth
I	Caviton	10
II	Kalzinol	10
III	Caviton and gutta-percha	10
IV	Kalzinol and gutta-percha	10

After 2 days and 7 days respectively, the teeth were removed from the dye and washed under running tap water. The specimens were split in half in mesiodistal

direction, and the greatest dye pentration at the tooth surface was recorded. The depth of dye penetration was evaluated according to the following scoring system.

Score 0 = no dye penetration

Score 1 = staining from occlusal surface up to one-third of the cavity wall

Score 2 = staining from occlusal surface up to two-third of the cavity wall

Score 3 = staining from occlusal surface up to more than two-thire of the cavity wall

Score 4 = staining to cotton pellets in root canal orifices

The dye penetration of each specimen was measured by two examiners using magnifying glass at a magnification of x3. When there was interexaminer variation on scoring certain samples, an agreement for the score was obtained after a discussion between the two examiners.

The data were statistically analysed by SPSS software version. 16, using Kruskal-Wallis Test, Mann-Whitney Test and Tukey HSD Test.

Results

In this study, the coronal microleakage in all specimens was determined by measuring the extent of linear dye penetration from margin of prepared endodontic access cavity to floor of the pulp chamber.

Figure 3. Photographic representation of dye penetration in double and single sealing techniques

Table 3. The results of the comparison between the microleakage of 2 days *versus* 7 days for each group by using Mann-Whitney U Test at a significant level of p= 0.05.

Groups	Materials	Mean Ranks		p Value
		2 days	7 days	
I	Caviton	6.80	14.20	0.002*
II	Kalzinol	5.50	15.50	0.001*
III	Caviton & gutta-percha	7.05	13.95	0.005*
IV	Kalzinol & gutta-percha	5.50	15.50	0.001*

(*) indicates statistically significant differences at p=0.05.

The results of statistical analysis made with Mann-Whitney U Test for the four experimental groups, as a function of two immersion periods, in dye solution are given in Table 3. At a significant level of p=0.05, there was statistically significant difference between two days immersion and 7 days immersion in microleakage of each experimental group.

Table 4. Mean ranks of the leakage scores measured as linear dye penetration for the temporary restorative materials in each experimental group (2 days).

Groups	Materials	Mean ranks (2 days)
I	Caviton	11.3[a]
II	Kalzinol	28.25[b]
III	Caviton & gutta-percha	12.95[a]
IV	Kalzinol & gutta-percha	29.5[b]
p value		0.001

Same letters indicate no statistical significant difference at p=0.05.

In Table 4, statistical analysis made with Kruskal-Wallis Test at significant level of p=0.05 for two days results were given, and there was statistically significant difference among four experimental groups on 2 days interval (p=0.001).

Table 5. Mean ranks of the leakage scores measured as linear dye penetration for the temporary restorative materials in each experimental group (7 days).

Groups	Materials	Mean ranks (7days)
I	Caviton	10.05[c]
II	Kalzinol	30.5[d]
III	Caviton & gutta-percha	10.95[c]
IV	Kalzinol & gutta-percha	30.5[d]
p value		0.001

Same letters indicate no statistical significant difference at p=0.05.

According to statistical analysis made by using Kruskal-Wallis Test at a significant level of p=0.05 (Table 5), statistically significant difference was observed among four experimental groups on 7 days interval (p=0.001).

Table 6. The results of multiple comparisons between groups carried out by Tukey HSD Test at 95% confidence interval for the specimens immersed in dye solution for 2 days interval.

	Group II	Group III	Group IV
Group I	0.001*	0.965	0.001*
Group II		0.001*	0.965
Group III			0.001*

(*) indicates statisticaly significant differences at p=0.05

Table 7. The results of multiple comparisons between groups carried out by Tukey HSD at 95% confidence interval for the specimens immersed in dye solution for 7 days interval.

	Group II	Group III	Group IV
Group I	0.001*	0.952	0.001*
Group II		0.001*	1.000
Group III			0.001*

(*) indicates statistically significant differences at p=0.05.

The results of Post-Hoc test made by using Tukey HSD test at 95% confidence interval are given in Table 6 and 7. According to the results, Caviton containing groups, *i.e*., group I and III, showed less microleakage than Kalzinol containing groups, *i.e*., group II and IV (p=0.001). Although gutta-percha temporary stopping material was placed beneath the Caviton and Kalzinol respectively in double sealing technique, marginal leakage was not significantly improved.

Discussion

After the initial chemomechanical phase of root canal treatment, the quality of coronal restoration seems to be the most important for periapical health of the tooth. Invasion of microorganisms into the pulpal space during endodontic therapy reduces the rate of success (Engstrom cited in Friedman, 1986). Todd & Harrison (1979) suggested that the interface between tooth substance and temporary restorative materials served as a pathway of leakage from the oral cavity into the pulp chamber. Therefore the sealing ability of temporary restorative materials used in endodontic therapy is important for the success of therapy.

In the present study, Caviton was observed more water tight seal than Kalzinol in both 2 days and 7 days intervals. The result of present study was in accordance with the number of studies which reported Caviton, Zinc oxide/calcium sulphate preparation, provided superior seal than Kalzinol and IRM which are reinforced Zinc oxide eugenol materials (Lee, *et al*., (1993) & Pai, *et. al*., (1999). Cruz, *et. al*., (2002) also showed that Caviton provided the better seal than Cavit which is a variant of Zinc oxide/calcium sulphate preparation.

The result of Kalzinol in this study was inferior to that of Caviton, and was in contrary to Friedman (1986) and Jacquot (1996) who showed that reinforced Zinc oxide eugenol provided more water tight seal than Zinc oxide/calcium sulphate preparation. However, the present study agreed with the results of the study performed by Tewari (2002). In that study, the severity of the leakage increased from the first day onward and on the seventh day total dye leakage was found in all teeth which were restored with Kalzinol.

The possible explanation for these observed results are: (1) Caviton is premixed material and this factor may reduce the inconsistencies related to chair-side

manipulation, and can be condensed properly against the cavity walls; (2) the dimensional stability of temporary restorative material depends on its water content. Widerman (1971) showed that Cavit has high linear hygroscopic expansion, probably caused by water absorption during setting. This expansion enhances the contact between the material and the dentinal walls, and also produces a better seal. Because of a variant of Zinc oxide/calcium sulphate preparation Caviton also possesses high linear expansion when it contacts with saliva in oral cavity or moisture, thereby preventing seepage of bacteria and promoting the success of root canal treatment.

In the present study, dye penetration into the material was noted in Caviton cement, and not in Kalzinol cement. It might be due to the fact that calcium sulphate, the main ingredient in Caviton, is hydrophilic; possibly, the material absorbs water from aqueous solution of the dye (Tasme, 1982). Eugenol, added to materials with a Zinc oxide powder, is oily substance and sometimes it remains free after the cement sets (Biven, 1972). Therefore, dye cannot penetrate into the material, and it only penetrates into the dentin-restoration interface.

In this study, double sealing technique employing gutta-percha as additional layer before placement of Caviton and Kalzinol respectively did not improved the sealing ability, when compared to a Caviton alone or Kalzinol alone. The result of the present study was consistent with the result of the study performed by Gekelman (1999) who showed that the used of gutta-percha layer under Cimpat, which is a hygroscopic material similar to Caviton, did not motivate any improvement to the seal of the restoration.

The possible explanations for sealing or leaking result might be due to material which possesses following properties: (1) high thermal expansion, (2) poor adaptation to the cavity wall, and (3) shrinks when used with heat or a solvent.

The results of the present study refer only to an in vitro condition. Clinically, the result could be influenced by the masticatory forces and thermal fluctuation present in oral cavity.

Conclusion

According to the results obtained from this experimental investigation, the following conclusions are drawn:

1. Both temporary restorative materials, namely Caviton and Kalzinol, leaked significantly at 7 days immersion period when compared with the leakage results of 2 days immersion. It implies that the microleakage of these temporary restorative materials increases with extended storage period.

2. For both immersion periods, 2 days versus 7 days, Caviton temporary restorative material exhibited superior sealing ability than did its counterpart, Kalzinol cement.

3. For both temporary restorative materials, viz, Caviton and Kalzinol, placement of gutta-percha temporary stopping material as an additional layer beneath each temporary restorative material to seal the coronal access cavity did not improve the sealing ability of each material at the two tested periods.

4. Either Caviton or Kalzinol has to be chosen as a temporary restorative material to seal the access cavity; it is unwise to keep them in situ even up to one week.

References

Biven, G.M., Bapna, M.S., Heuer, M.A., (1972). Effect of eugenol and eugenol-containing root canal sealers on the microhardness of human dentin. Journal of Dental Research.52: pp.1602-1609.

Cruz, E.V., Shigetani, Y., Ishikawa, K., Kota, K., Iwaku, M., Goodis, H.E., (2002). A laboratory study of coronal microleakage using four temporary restorative materials. International Endodontic Journal. 35: pp. 315-320.

Friedman, S., Shani, J., Stabholz, A., Kaplaw, J., (1986) . Comparative sealing ability of temporary filling materials evaluated by leakage of radiosodium. International Endodontic Journal. 19: pp. 187-193.

Gekelman, D., Deonízio, M.D.A., Prokopowitsch, I., Gavini, G., (1999). Microleakage of four temporary endodontic sealings after thermocycling. Ecler Endod. 1: pp. 1-9.

Jacquot, B.M., Panighi, M.M., Steinmetz, P., Sell, C. G., (1996). Microleakage of Cavit, Cavit-W, Cavit-G and IRM by impedance spectroscopy. International Endodontic Journal. 29: pp. 256-261.

Lee, Y.C., Yang, S.F., Hwang, Y.F., Chueh, L.H., Chung, K.H., (1993). Microleakage of endodontic temporary restorative materials. Journal of Endodontics. 19: pp. 516-520.

Pai, S.F., Yang, S.F., Sue, L.W., Chueh, L.H., Rivera, E.M., (1999). Microleakage between endodontic temporary restorative materials placed at different times. Journal of Endodontics. 25: pp. 453-456.

Sjögren, U., Figdor, D., Persson, S., Sundqvist, G., (1997). Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. International endodontic journal. 30: pp. 297-306.

Tamse, A., Ben-Amar, A., Gover, A., (1982). Sealing properties of temporary filling materials used in endodontics. Journal of Endodontics. 8: pp. 322-325.

Tewari, S., Tewari, S., Rohtak., Haryana., (2002). Assessment of coronal microleakage in intermediately restored endodontic access cavities. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 93: pp. 716-719.

Widerman, F.H., Eames, W.B., Serene, T.P., (1971). The physical and biologic properties of Cavit. Journal of American Dental Association. 82: pp. 378-382.

Original research

A comparative study on the dimensional accuracy of two types of elastomeric impression materials

San Thida Nyunt [1], Win Lwin [2] and Myint Myint San [3]

[1] Department of Conservative Dentistry, University of Dental Medicine, Yangon
[2] Department of Conservative Dentistry, University of Dental Medicine, Mandalay
[3] Department of Conservative Dentistry, University of Dental Medicine, Yangon

ABSTRACT

Dimensional accuracy of impression materials is crucial to the quality of fixed prosthodontic treatment. Successful crown and bridge works depend on accurate impressions. The aim of this study was to investigate the dimensional accuracy of two types of elastomeric impression materials, addition silicone and condensation silicone on two stainless steel master dies, 6◦ and 18◦ total occlusal convergence angles. For each master die, impressions were taken ten times with each impression material. The sample consisted of (40) stone dies. Type IV stone was poured into the impressions. The diameter and height of stainless steel master dies and stone dies were measured by using the digital caliper (accurate to 0.01 mm). The mean measurements of stone dies casted from different impression materials were recorded and diameter discrepancies and vertical height discrepancies were calculated. Mean percentage of deviations from the master dies for each test group were also calculated. The results were tabulated and analyzed by using unpaired *t* test. According to results of present study, there were greater diameter and vertical height of stone dies than stainless steel master dies by using Aquasil impression material. There were larger diameter but smaller vertical height of stone dies than stainless steel master dies by using Zetaplus impression material. The mean values of diameter and vertical height discrepancies and percentage of deviations of the samples that reproduced from master die 1 and master die 2 by using Zetaplus impression material were significantly greater than that of Aquasil impression material ($p < 0.05$). This study showed the addition silicone impression material was more dimensionally accurate than the condensation silicone impression material.

INTRODUCTION

Successful crown and bridge works depend on accurate impressions. Making the impressions to duplicate the prepared tooth morphology and surrounding tissues is an integral part of fixed prosthodontic procedure. The clinical success of fixed prosthodontic procedure is dependent, in part, upon the dimensional accuracy of elastomeric impression materials and impression procedures. Therefore, dimensional accuracy of impression materials is crucial to the quality of fixed prosthodontic treatment.

When considering the replication process of which impression making is a part, an understanding of the accuracy required of an impression material is essential (Wadhwani *et al*., 2005). A good impression is critical for an accurately fitting restoration. Flaws in the impressions will result in inaccuracies in the casts. A small void in the impression caused by trapping an air bubble on one of the occlusal surfaces will result in a nodule on the occlusal table. And then, it will lead to an inaccurate articulator mounting, and the diagnostic data will be incorrect.

An accurate impression is critical to the attainment of a precise fitting restoration (Eriksson *et al*., 1998). This is one important factor that determines

the longevity of restoration. The first step toward a successful outcome is the selection of the proper impression material for the appropriate application. Improper manipulation of impression material can lead to any inaccuracy throughout the whole procedure. Inaccuracies in the replication process will ultimately have an adverse effect on the fit and adaptation of the final restoration (Petrie *et al*., 2003). The choice of impression material is an important role in making the dental prosthesis.

An acceptable impression must be an exact or accurate record of all aspect of the prepared tooth (Rosenstiel *et al.*, 2001). If there is the discrepancy or a larger gap between the margin of the seated restoration and the corresponding preparation border line, it will increase the risk for secondary damages on the tooth.

MATERIALS AND METODS

In this study, there was evaluated the dimensional accuracy of two elastomeric impression materials on two stainless steel master dies (die no: 1 and die no: 2). For each die, there were replicated ten times with each impression material, therefore total number of (40) stone dies were obtained.

Two circular standardized stainless steel dies were milled to simulate the dimension of prepared teeth for crowns. The dies were labeled 1 and 2. Stainless steel die no: 1 has a diameter of (7.02) mm at the occlusal surface, the height of (5.81) mm (occlusocervically) and (90◦) shoulder margin. Stainless steel die no: 2 has a diameter of (6.11) mm at the occlusal surface, the height of (5.69) mm (occlusocervically) and (90◦) shoulder margin. Each die has tapering (6◦) and (18◦) total occlusal convergence angles respectively. Grooves were prepared on occlusal and proximal surfaces of stainless steel dies as reference points for taking measurements.

Before making the impression, the dies were thoroughly cleaned to remove any residue and contamination of the surface of the dies and allowed to air dry. Each stainless steel die was taken the impression by using perforated stainless steel impression tray to provide as uniform thickness (2 mm) of impression material. Holes were made on the surface of the stainless steel tray by straight fissure bur of (2 mm) in diameter on the surface of the tray for retention of impression material.

Two types of elastomeric impression materials, addition silicone, Aquasil (VPS) impression material and condensation silicone, Zetaplus impression material were used. All these materials, which were commercially available and recommended for use in making fixed partial denture impression, were stored at manufacturer's recommended temperatures before use and were mixed at room temperature so as to simulate their clinical use.

Aquasil (VPS), addition silicone impression material was mixed following the manufacturer's instructions. Equal lengths of Aquasil catalyst and base were dispensed onto the mixing pad. Impression material was mixed by using a stiff spatula and a stropping action. It was spatulated for approximately 30-45 seconds of mixing time. To obtain optimum physical properties, the impression was mixed completely homogeneous (streak-free) at room temperature and placed within the working time recommended by the manufacturer. And then mixed impression materials was loaded into the tray. After seating the tray, the impression was held with finger pressure on the stainless steel master die and took the impression. The impressions were carefully removed from the die after complete setting and examined any defects and irregularities. Then, the impressions were rinsed under running water and allowed to air dry. High strength Type IV dental stone, GC Fuji-Rock, was used while pouring the impression. Type IV gypsum (Fuji-Rock) with a ratio of 20 ml of distilled water to 100 g of stone powder was hand-mixed for 1 minute. The mixture was placed into the impression from one end in small increments with a small instrument until it completely filled the tray. While pouring, the impression was kept on a vibrator to avoid any air bubble entrapment. After 1 hour, the stone die was separated from the impression and the measurements of the reference lines were recorded and the mean values were taken. This procedure was repeated ten times for each stainless steel master die.

For the condensation silicone, Zetaplus impression material was mixed according to the manufacturer's instructions. Equal strand lengths of base material and activator were dispensed directly from the tubes on a clean mixing pad according to the manufacturer's instruction and mixed with a clean stainless steel

spatula. And then mixed impression material was loaded into the tray. The impression was seated to the predetermined position and held with finger pressure for an adequate amount of time to ensure that setting reaction was complete before removal. Since the reaction took place in room temperature, which was lower than the mouth temperature, the tray was held in place for a longer duration than the manufacturer's recommendation to ensure complete polymerization. After that, the impression was removed with straight pull directed along the path of withdrawal of the dies. The impression was checked and impression with voids and other inaccuracies were discarded. After impression making, these were rinsed under running water and allowed to air dry. Then, type IV stone was poured into the impression. After 1 hour, the stone die was separated from the impression and the measurements of the reference lines were recorded and the mean values were taken. This procedure was repeated ten times for each stainless steel master die.

For determining the dimensional accuracy of the impression materials, the dimensional comparison between the stainless steel dies and the stone dies were done. The dies were measured in two dimensions; diameter and vertical height of the stainless steel master dies were recorded. The mean measurements of stone dies casted from different impression materials were recorded and compared with the measurements of stainless steel master dies. And then diameter discrepancies, vertical height discrepancies and percentage of deviations were calculated.

Diameter Discrepancy = Diameter of stone die – Diameter of master die

Height Discrepancy = Height of stone die – Height of master die

The differences between the measurements of the stone dies and the measurements of the master dies, divided by the measurements of the master dies and multiplied by 100 were expressed as percentage of deviation from the master dies for each test group.

The percentage of deviation= [(Measurement of Stone Die - Measurement of Master Die) /

Measurement of Master Die] x 100

A greater amount of discrepancies meant less dimensional accuracy and a smaller amount of discrepancies indicated greater dimensional accuracy.

RESULTS

Comparing the results of two different impression materials, the mean values of diameter discrepancies and percentage of deviations of the samples that reproduced from master die 1 and master die 2 by using Zetaplus impression material were significantly greater than that of Aquasil impression material ($p < 0.05$).

The mean values of vertical height discrepancies and percentage of deviations of the samples that reproduced from master die 1 and master die 2 by using Zetaplus impression material were significantly greater than that of Aquasil impression material ($p < 0.05$).

DISCUSSION

The dimensional accuracy of impression materials is one of the important factors for the fabrication of the crown Both diameter and vertical height discrepancies of stone dies reproduced from master die 1 and master die 2 by using Aquasil impression material were positive values, that meant there were greater dimensions (both diameter and vertical height) of stone dies than that of stainless steel master dies by using Aquasil impression material.

For Zetaplus impression material, the diameter discrepancies of stone dies reproduced from master die 1 and master die 2 were positive values but vertical height discrepancies of stone dies reproduced from master die 1 and master die 2 were negative values. That indicated that larger diameter of stone dies were observed when compared with the stainless steel master dies but there were smaller vertical height of stone dies than that of stainless steel master dies by using Zetaplus impression material.

A positive change may be due to an overall contraction and a negative change may be represented an overall expansion of impression materials. But, the dimensional alterations may not occur equally in all directions (SÁ *et al*., 2008).

The polymerization shrinkage may be an important factor influencing the dimensional accuracy. It is

well understood that, for polymerized materials, the greater linear polymerization contraction resulting greater dimensional changes. Increase in dimensions may also be partially attributed to the impression material shrinkage upon setting towards the tray or by linear setting expansion of the die material.

For Zetaplus impression material, the stone dies wider in the horizontal aspect and shorter vertically. During polymerization reaction, the impression materials shrink towards the center of mass and then redirect this shrinkage towards the impression tray walls, resulting in image of the master die is larger in diameter but shorter in height.

CONCLUSION

Well-fitting indirect restorations can only be made when there are accurate models of the oral tissues available, made from high quality impressions. A defective impression may lead to an inaccurate model. Distortion of impression is a problem that is inherent in all of the steps involved in fabricating an indirect restoration and yield poor result.

Addition silicone and condensation silicone are elastomeric impression materials widely used in dentistry. Although silicones are considered to be materials of the greatest accuracy and precision, they are still subjected to some dimensional changes.

According to the results obtained in this study regarding linear dimensional changes of the resulting stone dies, the following conclusion can be drawn:

Dimensional accuracy of addition silicone impression material, Aquasil,was better than condensation silicone impression material, Zetaplus.

There was a statistically significant difference in the dimensional accuracy between two impression materials ($p < 0.05$). ADA Specification Number 19 recommended a maximum negative change in dimension of 0.5% after a minimum of 24 hr (Council on Dental Materials and Devices, 1977). According to the results of this study, percentage of deviation (height) of the samples reproduced from master die 2 (18◦ TOC angle) by using Aquasil impression material were within the range of 0.18 to 0.73 (mean 0.441) and other results showed the dimensional changes exceeded 0.5%. These dimensional changes may depend on certain important factors such as working time, setting time, temperature, correct manipulation of impression materials, material volume and uniform thickness of impression material.

The impression making procedure is the basis step towards a successful outcome. It is not only important to select the proper impression material but also need to minimize the possible procedure errors in each and every step.

REFERENCE LISTS

Berg,J.C., Johnson,G.H. and Lepe,X., (2003). Temperature effects on the rheological properties of current polyether and polysiloxane impression materials during setting. *Journal of Prosthetic Dentistry*, 90: pp. 150-161.

Caputi,S. and Varvara,G., (2008). Dimensional accuracy of resultant casts made by a monophase, one-step and two-step, and a novel two-step putty/ light-body impression techinique: an in vitro study. *Journal of Prosthetic Dentistry*, 99: pp. 274-281.

Ceyhan,J.A., Johnson, G.H. and Lepe,X., (2003). The effect of tray selection, viscosity of impression material, and sequence of pour on the accuracy of dies made from dual-arch impressions. *Journal of Prosthetic Dentistry*, 90: pp. 143-149.

Chee,W.W.L. and Donovan,T.E., (1992). Polyvinyl siloxane impression materials:A review of properties and techniques. *Journal of Prosthetic Dentistry*, 68: pp. 728-732.

Chen,S.Y., Liang,W.M. and Chen,F.N., (2004). Factors affecting the accuracy of elastomeric impression materials. *Journal of Dentistry*, 32(8): pp. 603-609.

Combe, E.C. and Grant, A. A., (1992). *Notes on Dental Materials*. Sixth Edition. pp. 115-126.

Eriksson,A., Ockert-Eriksson,G. and Lockowandt,P., (1998). Accuracy of irreversible hydrocolloids (alginates) for fixed prosthodontics. A comparison between irreversible hydrocolloid, reversible hydrocolloid, and addition silicone for use in the syringe-tray technique. *European Journal of Oral Science*,106: pp. 651–660.

Petrie,C.S., Walker,M.P., O'Mahony,A.M. and Spencer**,**P., (2003). Dimensional accuracy and

surface detail reproduction of two hydrophilic vinyl polysiloxane impression materials tested under dry, moist, and wet conditions. *Journal of Prosthetic Dentistry*, 90: pp. 365-372.

Rosenstiel,S.F., Land, M.F. and Fujimoto,J., (2001). *Contemporary Fixed Prosthodontics.* Third Edition. pp. 354-377.

Wadhwani,C.P.K., Jhonson,G.H., Lepe,X. and Raigrodski,A.J., (2005). Accuracy of newly formulated fast-setting elastomeric impression materials. *Journal of Prosthetic Dentistry*, 93: pp.530-539.

Table 1. The discrepancies and percentage of deviations calculated for the diameter of the samples reproduced from master die 1 and master die 2

Diameter Discrepancy = Diameter of stone die–Diameter of master die

Serial No.	Aquasil				Zetaplus			
	Diameter Discrepancies		Percentage of Deviation		Diameter Discrepancies		Percentage of Deviation	
	Die 1	Die 2	Die 1	Die 2	Die 1	Die 2	Die 1	Die 2
1	0.22	0.07	3.13	1.15	0.48	0.12	6.84	1.96
2	0.20	0.08	2.85	1.31	0.48	0.10	6.84	1.64
3	0.20	0.12	2.85	1.96	0.46	0.13	6.55	2.13
4	0.21	0.10	2.99	1.64	0.38	0.13	5.41	2.13
5	0.20	0.11	2.85	1.80	0.41	0.12	5.84	1.96
6	0.20	0.11	2.85	1.80	0.38	0.13	5.41	2.13
7	0.20	0.12	2.85	1.96	0.29	0.10	4.13	1.64
8	0.20	0.09	2.85	1.47	0.19	0.09	2.71	1.47
9	0.19	0.09	2.71	1.47	0.20	0.09	2.85	1.47
10	0.20	0.07	2.85	1.15	0.19	0.13	2.71	2.13

Table 2. The results of statistical analysis made by using unpaired student's *t* test for the diameter discrepancies and percentage of deviations at a significant level of p=0.05

Impression Materials	Master Die 1 group		Master Die 2 group	
	Discrepancies in mm (Mean ± SD)	Percentage of Deviation (Mean±SD)	Discrepancies in mm (Mean ± SD)	Percentage of Deviation (Mean±SD)
Aquasil	0.202 (0.0079)	2.878 (0.1104)	0.096 (0.019)	1.571 (0.3082)
Zetaplus	0.346 (0.1195)	4.929 (1.7007)	0.114 (0.0171)	1.866 (0.2813)
p value	0.001	0.001	0.039	0.038

Table 3. The discrepancies and percentage of deviations calculated for the vertical height of the samples reproduced from master die 1 and master die 2

Height Discrepancy = Height of stone die – Height of master die

Serial No.	Aquasil				Zetaplus			
	Height Discrepancies		Percentage of Deviation		Height Discrepancies		Percentage of Deviation	
	Die 1	Die 2	Die1	Die2	Die 1	Die 2	Die1	Die 2
1	0.10	0.03	1.72	0.53	-0.48	-0.09	-8.26	-1.58
2	0.11	0.01	1.89	0.18	-0.48	-0.10	-8.26	-1.76
3	0.12	0.02	2.07	0.35	-0.21	-0.10	-3.61	-1.76
4	0.12	0.03	2.07	0.53	-0.23	-0.08	-3.96	-1.41
5	0.12	0.02	2.07	0.35	-0.17	-0.08	-2.93	-1.41
6	0.11	0.03	1.89	0.53	-0.16	-0.07	-2.75	-1.23
7	0.11	0.04	1.89	0.70	-0.16	-0.07	-2.75	-1.23
8	0.11	0.03	1.89	0.53	-0.16	-0.05	-2.75	-0.88
9	0.11	0.01	1.89	0.18	-0.14	-0.03	-2.41	-0.53
10	0.11	0.03	1.89	0.53	-0.14	-0.05	-2.41	-0.88

Table 4. The results of statistical analysis made by using unpaired student's t test for the vertical height discrepancies and percentage of deviations at a significant level of p=0.05

Impression Materials	**Master Die 1 group**		**Master Die 2 group**	
	Discrepancies in mm (Mean ± SD)	**Percentage of Deviation (Mean±SD)**	**Discrepancies in mm (Mean ± SD)**	**Percentage of Deviation (Mean±SD)**
Aquasil	0.112 (0.0063)	1.927 (0.1118)	0.025 (0.0097)	0.441 (0.1698)
Zetaplus	-0.233 (0.1333)	-4.009 (2.2934)	-0.072 (0.0203)	-1.267 (0.4042)
p value	0.000	0.000	0.000	0.000

Figure 1. Diagram of Stainless Steel Die 1 and Stainless Steel Die 2

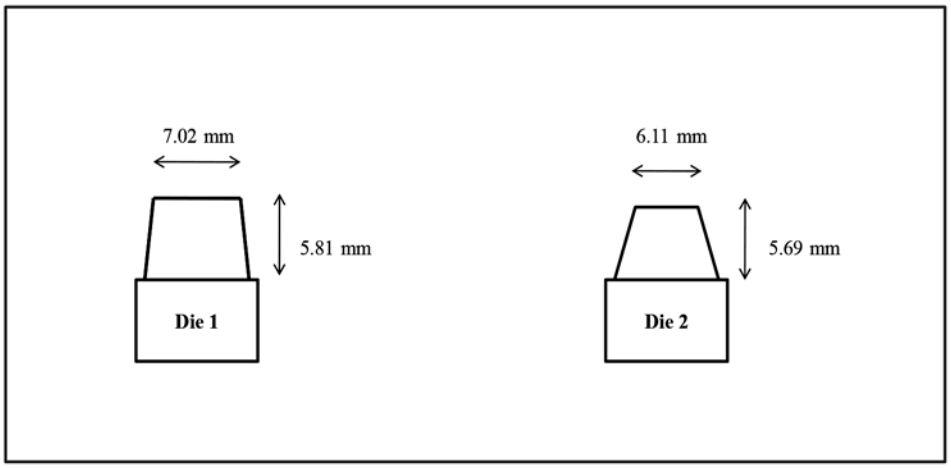


Figure 2. Aquasil impression material

Figure 3. Zetaplus impression material

Figure 4. Stone dies casted from Stainless steel die number: 1 by Aquasil impression material

Figure 5. Stone dies casted from Stainless steel die number: 1 by Zetaplus impression material

Figure 6. Stone dies casted from Stainless steel die number: 2 by Aquasil impression material

Figure 7. Stone dies casted from Stainless steel die number: 2 by Zetaplus impression material

Original Research

In vitro study of margical fit of ceramage crown related to different margin designs

Yee Mon Shwe [1], Win Lwin [2], Myint Myint San [1]

[1] Department of Conservative Dentistry, University of Dental Medicine, Yangon, Myanmar

[2] Department of Conservative Dentistry, University of Dental Medicine, Mandalay, Myanmar

ABSTRACT

The objective of this study was to investigate the effect of margin design on the marginal fit of Ceramage (indirect resin composite) crown, by two evaluation methods; evaluation in cemented crowns and the evaluation in non-cemented crowns. Three stainless steel dies with a total convergence of 6° and different margin designs (90° rounded shoulder, chamfer and 110° sloped shoulder) were milled with CNC (computer numerical control) machine. For evaluation in cemented crowns, a total of 54 crowns (18 for each design) were fabricated. The crowns were seated onto the stone dies and cemented with Glass Ionomer Cement. Each cemented crown was then longitudinally sectioned into equal halves. SEM (Scanning Electron Microscope) at 100 x magnification was used to evaluate the marginal fit of test specimens. For evaluation in non-cemented crowns, 30 crowns (10 for each design) were made on the stone dies. Marginal gaps were evaluated on their respective steel dies at 40 x magnification using USB (Universal Serial Bus) microscope. In cemented crowns, mean values were: 70.43 ± 30.36 μm in chamfer, 65.43 ± 25.79 μm in shoulder and 59.17 ± 20.91 μm in sloped shoulder. In non-cemented crowns, the means were: 58.19 ± 21.84 μm, 46.99 ± 34.9 μm and 43.87±17.38 μm in chamfer, shoulder and 110º sloped shoulder respectively. One-way ANOVA analysis showed that there was no statistically significant difference in marginal gaps of three margin designs in both evaluation methods.

Key words: Indirect resin composite, Marginal gap, Marginal opening, Full veneer crown

INTRODUCTION

Nowadays, major concern about esthetic dentistry leads to development of metal free, tooth colored restorative materials, such as high strength porcelain and new generation indirect resin composite materials. The second-generation indirect composites have microhybrid fillers with a diameter of 0.04–1 *μm*, which is in contrast to that of the first-generation composites that were microfilled. The filler content is also twice that of the organic matrix content in the second-generation indirect composites.

Ceramage (Shofu, Japan) is a micro ceramic composite system with a filler content of 73% (PFS-Progressive Fine Structured fillers and nano hybrid fillers) supported by an organic polymer matrix. The filler is mainly zirconium silicate and resin matrix contains urethane type. Metal-free polymer crowns have the benefit of requiring less axial tooth reduction than all ceramic or metal-ceramic crowns (Rammelsberg *et.al*., 2005). With the advancement in resin cement, the bond between the resin composite crown and resin cement would probably be effective in obtaining better marginal seal.

Accuracy of fit is accepted as a very important factor when fabricating a full veneer crown. Among the different margin designs for full dental crown, 1.2 – 1.5 mm wide shoulder or deep chamfer finish line can be used for composite crowns (Rosenstiel *et.al*., 2001). Gap measurements at margin are frequently used to quantify fit (Groten and coworkers, 2000). Two common methods used to measure the marginal gap are measurement of marginal gaps after cementation of the crowns, and measurement of marginal gap of non- cemented crowns along the

circumference of the crown/tooth interface.

This study was to test whether the marginal fitness of Ceramage crown is within satisfactory range and to assess the role of margin design (radial or rounded shoulder, chamfer and 110° sloped shoulder) on marginal fit. This assessment was done by two evaluation methods (evaluation in cemented crowns and evaluation in non-cemented crowns). The null hypothesis stated was that different margin designs of Ceramage crown would not influence the marginal fit of the full veneer crown whether cemented or not.

MATERIALS AND METHODS

Three stainless steel dies were fabricated by milling with computer numerical control (CNC) machine. Each die had the following dimension. 9 mm in diameter at cervical area, 6.37 mm in diameter at occlusal surface and 6 mm from occlusal surface to the cervical end of the preparation. All dies had total occlusal convergence angle of 6 degree (Figure 1). 1.3 mm width of groove was placed on the occlusal surface of each die for orientation of the crowns. Each die had 1 mm width of different margin designs (90 degree shoulder with rounded internal line angle, chamfer and 110 degree sloped shoulder).

Impressions of dies were made using medium bodied, addition silicone impression material (Aquasil Monophase, Dentsply International,USA) with custom acrylic tray. For evaluation in cemented crowns, a total of 54 (18 impressions per system of steel die) were made. For evaluation in non-cemented crowns, a total of 30 (10 impressions per system of steel die) were made. Impressions were then poured with type Ⅳ dental stone (Fuji Rock, GC, Dentsply, USA) and 84 model dies were made. Next, Ceramage composite crowns were made according to the manufacturer's recommendation. Polymerizations of Ceramage composite were performed in light-curing unit; Solidilite V (Shofu, Kyoto, Japan) (Figure 2). All crowns were fabricated with the same dimension by using a silicone index. The fabrication of all full veneer crowns was performed by the same operator.

The marginal gaps were evaluated with two evaluation methods (evaluation in non-cemented crowns and in cemented crowns) by using USB microscope and SEM respectively.

Measurement of marginal gap in non- cemented crowns with USB microscope

Each of 30 (10 for each margin) crowns was fixed on their respective steel dies with the aid of a device; G clamp to prevent movement during measurement. USB (universal serial bus) microscope at 40 x magnification with the image analyzing software (MicroCapture software) was used for marginal gaps measurement. Four diametrical opposing points had been chosen in the samples for the readings of the marginal gap. In each one of the points, five measurements had been carried through and the total of 20 accomplished measurements per crown was achieved. The mean of these 20 values were taken as a mean of each crown. Means and standard deviations were calculated for each group. Gap distance was defined as the perpendicular measurement from the most cervical extent of the crown to the most cervical extent of finishing line (Absolute marginal opening (AMO)- according to Holmes, 1989) (Figure 3).

Measurement of marginal gap in cemented crowns with SEM

The 54 (18 for each margin) crowns were cemented to the stone dies with type I Glass Ionomer Cement (GIC). During cementation, constant defined load was applied onto the die with axially directed load applying device (Figure 4). Cementation force was set at 213 Newton (48 lb) for 4 minutes. Each cemented crown was then sectioned through the center of the crown perpendicular to its longitudinal axis into equal halves with a diamond disc. One section was then polished and examined under SEM (JEOL, JSM- 5610, Tokyo,Japan) at 100 magnifications to measure the marginal gap of the crowns (Figure 5).

The marginal gap (marginal opening, MO) of each crown was evaluated by measuring the vertical perpendicular distance from the internal surface of the crown margin to the prepared cervical margin of the die (Figure 6). The measurements for each crown were carried out at two points, at labial and lingual margins. The mean of these two values was taken as a mean of each crown. Data were analyzed with one way analysis of the variance (ANOVA) by using SPSS 16 software. The level of significance was established at 0.05.

Results

The mean values and standard deviations of the marginal gaps recorded for all groups are listed in tables 1 and 3 and shown graphically in Fig. 7. One way ANOVA results are presented in tables 2 and 4 and these results shows that there was no statistically significant difference ($P > 0.05$) in different margin designs. Therefore three different margin designs do not significantly affect the overall marginal adaptation of Ceramage crown in both evaluation methods.

DISCUSSION

The marginal openings between 100 and 200 μm are considered clinically acceptable with regard to longevity despite theoretical requirements of cementation films between 25 and 40 μm (Boening *et.al*., 2000). McLean and von Fraunhofer (1971) stated that marginal gap as high as 120 μm is considered clinically acceptable. Based on these findings, crowns fabricated with Ceramage indirect resin composite system demonstrated clinically acceptable range of marginal adaptation in general and well below maximum acceptable value after cementation.

In present study, the marginal gaps of different margin designs (chamfer, 90° rounded shoulder, 110° sloped shoulder) were not significantly different in both evaluation methods. Both methods have found to prove that cervical preparation for Ceramage crown with chamfer, 90° shoulder of 110° sloped shoulder would not affect on marginal gap formation.

One of the inherent properties of polymer-based materials is shrinkage during polymerization (Kim and Watts, 2004). Polymerization shrinkage around margin is probably major reason for marginal discrepancies. It is stated that Ceramage composite exhibit about 2.5 vol % of polymerization shrinkage. The lack of bonding to periphery permitted almost unrestricted three-dimensional volumetric shrinkage of the resin composite. The greater the circumferential composite thickness at the margin may cause the greater shrinkage at the margin. The amount of polymerization shrinkage at the margin is corresponding to the amount of gap formation at the margins.

In the current study ,even though the area at the shoulder margin may be greater than that of chamfer, the configuration of shoulder margin design favors the more precise adaptation of composite to the marginal area and over adaptation is unlikely when compared to chamfer margin. This may be the cause of lower marginal gap in shoulder than that of chamfer. The study of Cho *et.al.* (2004) concluded that rounded shoulder provide the better marginal fit than chamfer margin. They claimed that clear marginal defects of the shoulder finish line could be detected more easily than the defects in the other finish lines. Thus, adding composite material to the marginal defects can be done more frequently.

For cast metal crown, the more the restoration margin ends with an acute angle, the shorter the distance between the restoration margin and the tooth (Schillinburg *et.al*.,1997). For composite crowns, acute margin design of 110° margin had the lowest values in both methods, but the difference was not statistically significant. In cemented crowns with SEM evaluation method, the type of margin did not influence marginal adaptation after cementation. All these margin configurations likely allow for similar escape of the luting agents tested.

Some studies on composite crowns (Akbar *et.al*.,2006 and Tsitrou *et.al*.,2007) revealed that the finish line design had no influence on marginal adaptation, while others (Cho *et.al.*,2004) reported that shoulder type of preparation provide the better marginal fit than chamfer margin designs. The dissimilarity of the results of the researches may be because of variation in the mateials and methods used in various investigators studying marginal fit. Different methods that quantify marginal fit include - measurement of sectioned specimens, measurement of specimens or their replica by direct visualization, measurement of the replica of the marginal gap (replica technique), tactile examination using an explorer, and radiographs (Ayad *et.al*.,2009). Among these techniques, measurement of sectioned specimens of cemented crowns and measurement of specimens by direct visualization in non- cemented crowns are commonly used methods.

Measurement of sectioned specimen requires cementation of the crown. The hydraulic back pressure of the cement can increase the marginal gap. So the film thickness of cement can be one of

the confounding variables affecting the marginal fit. The evaluation of sectioned crown limits the number of measurement per specimen. However, the configurations of the margin design were well revealed in cross-sectioned view. In addition, overcontour or undercontour of the crown margin did not affect the marginal gap evaluation and measurement. Moreover, this method permits an accurate focus of marginal gap on crown-tooth restoration interface.

SEM imaging provided the images of high resolution and could show the fine destination of cement-crown interface and cement-die interface. In this method, marginal opening (MO) - the vertical perpendicular distance from the internal surface of the crown margin to the prepared cervical margin of the die was measured. SEM evaluation on sectioned die needs to fix a crown to die with cement. Although cementation might influence marginal gap, the variation could be reduced by standardization of cementation procedure.

In another evaluation method, luting agent was not used and marginal gaps were measured directly along the circumference of the margin at the crown/ tooth interface. This technique has the advantage of being noninvasive, convenient, accurate, easy and rapid for determining the marginal gap distance. However, it is difficult to repeat the measurements from an identical angle and to distinguish the real marginal gap from its projection (Martínez-Rus *et.al.,* 2011). The measurement in this method is the measurement from the most cervical extent of the crown to the most cervical extent of finishing line; absolute marginal discrepancy or absolute marginal opening (AMO). Therefore, reference points used in measurement are different in both methods.

However, AMO might vary significantly depending on the over-extension or under-extension of the crowns. The margins of the crown and die may seem to be sharp clinically, but appear rounded when microscopically viewed. It is difficult to select a point where the marginal opening is to be measured. Therefore, in this study not only AMO but also MO was measured in order to evaluate the marginal gaps of Ceramage crowns in different situations.

Some investigators prefer the gap measurement of non-cemented crown by direct evaluation under microscope because it is believed that when cementing them, the precision of primary adaptation is lost and the influence of the cement type, viscosity and luting techniques and seating force become preponderant (Hilgert *et.al.* , 2004). The direct view method using the USB microscope is considered convenient, accurate, easy and rapid for determining the marginal gap distance.

There were some limitations in this study. (1) The CNC prepared steel die was used instead of the natural tooth. However these dies could provide standardizing the preparation dimension. Another limitation is that, (2) different measuring devices were used in each method. SEM imaging system is used in many researches of marginal fit evaluation because of its high accuracy. On the other hand, USB microscope with image analyzing software is the easier way of marginal gap measurement. Hence, both devices can be used to measure marginal discrepancies. (3)All retainers were produced and tested under ideal conditions, which might not reflect the precision in clinical use.

Within the limitation of this study, it is noticed that the marginal fit of indirect composite (Ceramage) crowns were not influenced by the different margin designs. This could be attributed to small difference in polymerization shrinkage of composite resin due to similar composite thickness occupied at three marginal sites.

CONCLUSION

Within the limitations of this *in vitro* study, the conclusion can be drawn that-

(1) There was no statistically significant difference in marginal gap between chamfer, 90° rounded shoulder and 110° sloped shoulder margin design.

(2) The mean marginal gaps of resin composite (Ceramage) crowns with different margin designs were within the range of clinical acceptance (less than 120 μm).

(3) Although results of both methods are similar, evaluation in non-cemented crowns is easy and rapid in addition to being non-destructive unlike evaluation in cemented crowns.

REFERENCES

Akbar, J.H., Petrie, C.S., Walker, M.P., Williams, K. and Eick, J.D., (2006). Marginal adaptation of Cerec 3 CAD/CAM composite crowns using two different finish line preparation designs. *J Prosthodont*, 15: pp.155-163.

Ayad, M.F., (2009). Effects of tooth preparation burs and luting cement types on the marginal fit of extracoronal restorations. *J Prosthetic Dentistry*, 18: pp.145–151.

Boening, K,W., Wolf, B.H., Sehmidt ,A.E., Kastner ,K. and Walter ,M.H., (2000). Clinical fit of procera allceram crowns. *J Prosthet Dent*, 84(4): pp.419-424.

Cho, L.R., Choi, J.M., Yi, Y.J. and Park, C.J., (2004). Effect of finish line on marginal accuracy and fracture strength of ceramic optimized polymer / fiber – reinforced composite crowns. *J Prosthet Dent*, 91(6): pp.554-559.

Groten, M., Axmann, D., Probster, L. and Weber, H., (2000).Determination of the minimum number of marginal gap measurements required for practical in vitro testing , *J Prosthetic Dentistry* , 83(1): pp.40-49.

Hilgert, E., Buso, L., Neisser , M.P. and Bottino, M.A., (2004). Evaluation of marginal adaptation of ceramic crowns depending on the marginal design and the addition of ceramic. *Braz J Oral Sci* , 3(11). pp.619-623.

Holmes, J.R, Bayne, S.C., Holland, G.A. and Sulik, W.D., (1989). Considerations in measurement of marginal fit. *J Prosthet dent*, 62: pp.405-408.

Kim, S.H. and Watts, D.C., (2004). Polymerization shrinkage-strain kinetics of temporary crown and bridge materials. *Dental Materials*, 20:pp.88–95.

Martínez-Rus, F., María, J.S., Begoña, R. and Pradíes, G., (2011). Evaluation of the absolute marginal discrepancy of zirconia-based ceramic copings. *J Prosthet Dent*, 105: pp.108-114.

McLean, J.W. and von Fraunhofer, J.A., (1971) . The estimation of cement film thickness by an *in vivo* technique. *Br Dent J* ,131: pp.107-111.

Rammelsberg,P.,Spiegl,K.,Eickemeyer, G.,Schmitter,M.,(2005).Clinical performance of metal-free polymer crowns after 3 years in service. *J Dent*, 33: pp.517-523.

Rosenstiel, S.F., Land, M.F. and Fujimoto, J., (2001). *Contemporary Fixed Prosthodontics.* Third Edition. Mosby Inc, Missouri,U.S.A.

Shillingburg, H.T., Hobo, S., Whitsett, L.D., Jacobi, R. and Brackett, S.E., (1997). *Fundamental of Fixed Prosthodontics*, Third Edition, Quintessence Publishing Co, Inc, Carol Stream.

Tsitrou, A., Northeast ,S.E. and van Noort, R., (2007). Evaluation of the marginal fit of three margin designs of resin composite crowns using CAD/CAM. *Journal of Dentistry,* 35 (1): pp.68-73.

Figure 1. Schematic presentation for preparation design of stainless steel die with shoulder, chamfer and 110 º sloped shoulder margin

Figure 2. Ceramage composite materials and light curing unit (Solidite V)

Figure 3. Points of measurement of the marginal gap (in non-cemented crown)

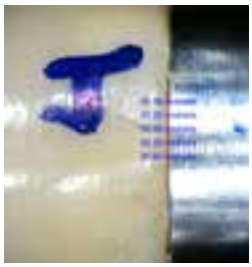


Figure 4. Load applying device used in cementation

Figure 5. SEM Photomicrograph (x 100) of marginal gap at 90° rounded shoulder margin

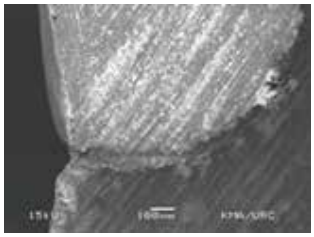


Figure 6. Points of measurement of the marginal gap in different marginal situations (in cemented crown)

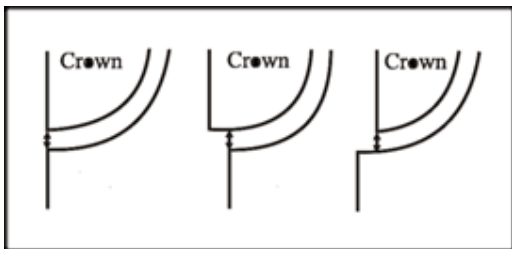


Table (1) Means and standard deviations of marginal gaps in three different margin designs (in cemented crowns)

Margin design	number	Mean (µm)	Standard deviation (µm)
90˚rounded shoulder	18	65.43	25.79
Chamfer	18	70.43	30.36
110˚sloped shoulder	18	59.17	20.91
Total	54	65.01	25.90

Table (2). Results of one way ANOVA test for marginal gaps of three different margin designs (in cemented crowns)

	Sum of Squares	Degree of freedom	Mean Square	F ratio	p value
Between Groups	1145.342	2	572.671	.849	.434
Within Groups	34420.462	51	674.911		
Total	35565.804	53			

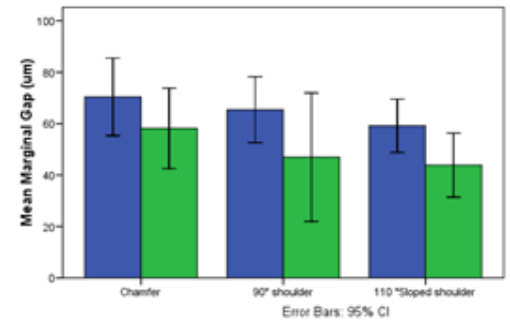
Table (3) Means and standard deviations of marginal gaps in three margin designs (in non-cemented crowns)

Margin design	Number	Mean (µm)	SD (µm)
90°rounded shoulder	10	46.99	34.90
Chamfer	10	58.19	21.84
110°sloped shoulder	10	43.87	17.38
Total	30	49.68	25.67

Table (4) Results of one way ANOVA test for marginal gaps of three different margin designs (in non-cemented crowns)

	Sum of Squares	Degree of freedom	Mean Square	F ratio	p
Between Groups	1134.06	2	567.0301	0.851734	0.437
Within Groups	17974.88	27	665.7364		
Total	19108.94	29			

Figure (7) Marginal gaps in three groups of margin design (Cemented vs Non-Cemented crowns according to different evaluation methods)



Marginal gaps in cemented crowns

Marginal gaps in non-cemented crowns

Case Report

A case report of Superior Ankyloglossia

Soe Khaing Thet Suu[1], Khin Maung[1], Sun Sun Win[2]

[1] Oral and maxillofacial surgical ward, (1000) Bedded Naypyitaw General Hospital, Department of Health

[2] Department of Pediatric Dentistry, University of Dental Medicine (Yangon), Department of Medical Science

Abstract

A congenital abnormality (birth defect) is an abnormality in body structure or function that is present at birth. Ankyloglossia, also known as tongue-tie is not uncommon birth defect in oro-facial structure, in which abnormal shortness of the frenum resulting in limitation of its movements. If it is functionally accepted, not all the cases of ankyloglossia need to be treated surgically. A 5-days old infant was referred to Oral and maxilla-facial surgical Department, of Naypyitaw Hospital, with a complaint of tongue fused to the palate. The attachment of tongue to the palate, which is known as superior ankyloglossia is a rare anomaly. Functional limitation presenting with superior ankyloglosssia is difficulty in feeding because of limitation of tongue movement and cannot perform suckling action. Before surgical separation of tongue from palate, patient supportive care was done in co-operation with Pediatric Department of Naypyitaw Hospital. Patient's development and medical condition had been assessed by consultant pediatrician and whether the infant can be operated under general anesthesia was assessed by consultant anaesthesiologist. By co-operation of surgeon, pediatrician and anesthesiologist, the patient had operation done at the age of 5 months successfully, without any complications. A team work approach brought a successful outcome in this rare case of superior ankyloglossia.

Keyword: Superior ankyloglossia

Introduction

Superior ankyloglossia (or) Ankyloglossum superius is rare congenital craniofacial condition characterized by tongue tip adherence to the hard palate and associated limb abnormalities (Bolling *et al.*, 2007). Superior ankyloglossia presents as part of aglossy-adactylly syndrome, Hanhart syndrome and oro-facio-digital syndrome (Kothari and Gupta, 2005).

Case report

A five-day old male infant, born on 26th May 2012 was referred to oral and maxillofacial surgical ward of (1000) Bedded Naypyitaw General Hospital from Taungoo General Hospital with chief compliant of congenital anomaly in tongue. By history taking, it was known that he was delivered at Swa Hospital of Yedashe Township in Bago Division, as emergency LSCS, and weighed 2.7 kg at birth. There was no congenital anomaly in family and the 28-year old mother already had had a normal child.

On clinical examination, there was abnormal attachment of the tongue tip to anterior part of palate about 5-7 mm (fig-1), and the patient also seems to have slight micrognathic appearance (Fig-2).

Fig-1 photograph showing abnormal adhesion of tongue tip to palate

Fig-2 photograph showing slight micrognathic appearance

Abnormality was also noted at upper limbs; absence of finger nails and abnormal shortening in right index, middle and ring fingers (Fig-3), and in left index finger (fig-4).

Fig-3 photograph showing right hand

Fig- 4 photograph showing left hand

Management

Supportive care

Since the infant had attached tongue to the palate, limitation of tongue movement was present and cannot perform suckling action. Consultation with pediatrician was urgently done for feeding problem, and supportive care.

To find out if the patient had other congenital anomalies or not and for supportive care, the infant had been transferred out to the Child ward of (1000) Bedded Naypyitaw Hospital. He had given test feeding of 50cc/3hrly through naso-gastric tube from that day onwards. Necessary investigations were made by pediatrician and no signs and symptoms of syndromic condition were found. When the patient was nine days old, he was referred back to OMFS ward for further management of superior ankyloglossia.

Oral and maxillofacial management

Operation had been planned at the child's age of 3 months and older. Follow up was done monthly both by pediatrician and surgeon. Meanwhile, the child had practiced spoon feeding very well. At the age of 3 months and body weight became 4kg, he was admitted to OMFS ward for operation. When anaesthetic assessment was done, it was found that he had chest infection and operation had postponed until there is no chest infection.

Pediatrician gave him antibiotics of Amoxicillin 4ml (125mg/5ml) 8hrly for one week and follow up was done by Child ward. One month later he was again admitted to OMFS ward, and necessary assessments were done. When anaesthesiologist and pediatrician recommended that the child was fit for surgery, operation was performed on 17th October 2012 as elective surgery.

Although there was limitation of mandibular movement, oro-endotracheal tube intubation was successfully performed by anaesthesiologist (Associate Professor Dr. Daw Mu Mu Naing). To get minimal haemorrhage and post-operative anaesthesia, 2% lignocaine with 1:100,000 adrenalin (1.8ml) was injected to the tip of the tongue, and separation of tongue-palate was done by using cautery. Incised wound of tongue was sutured with

4/0 vicryl until there was no bleeding.

Post-operative management

For infection control, antibiotics (Blumox-P 125mg 8hrly) was given for a week, and for pain management, analgesics of paracetamol 125mg was given 8hrly for 5 days. Spoon feeding was allowed after 2 hours operation.

During first and second post-operative days, the child had fever (99.6 F- 101 F). But no feeding problem and bleeding was seen. From third post-operative day onwards, no fever and he went back home on 22nd October 2012 (5th post-operative day).

Follow up

The patient was recalled after one week for follow up review. There was no compliant or complications present. After that, it was done regular follow up monthly.

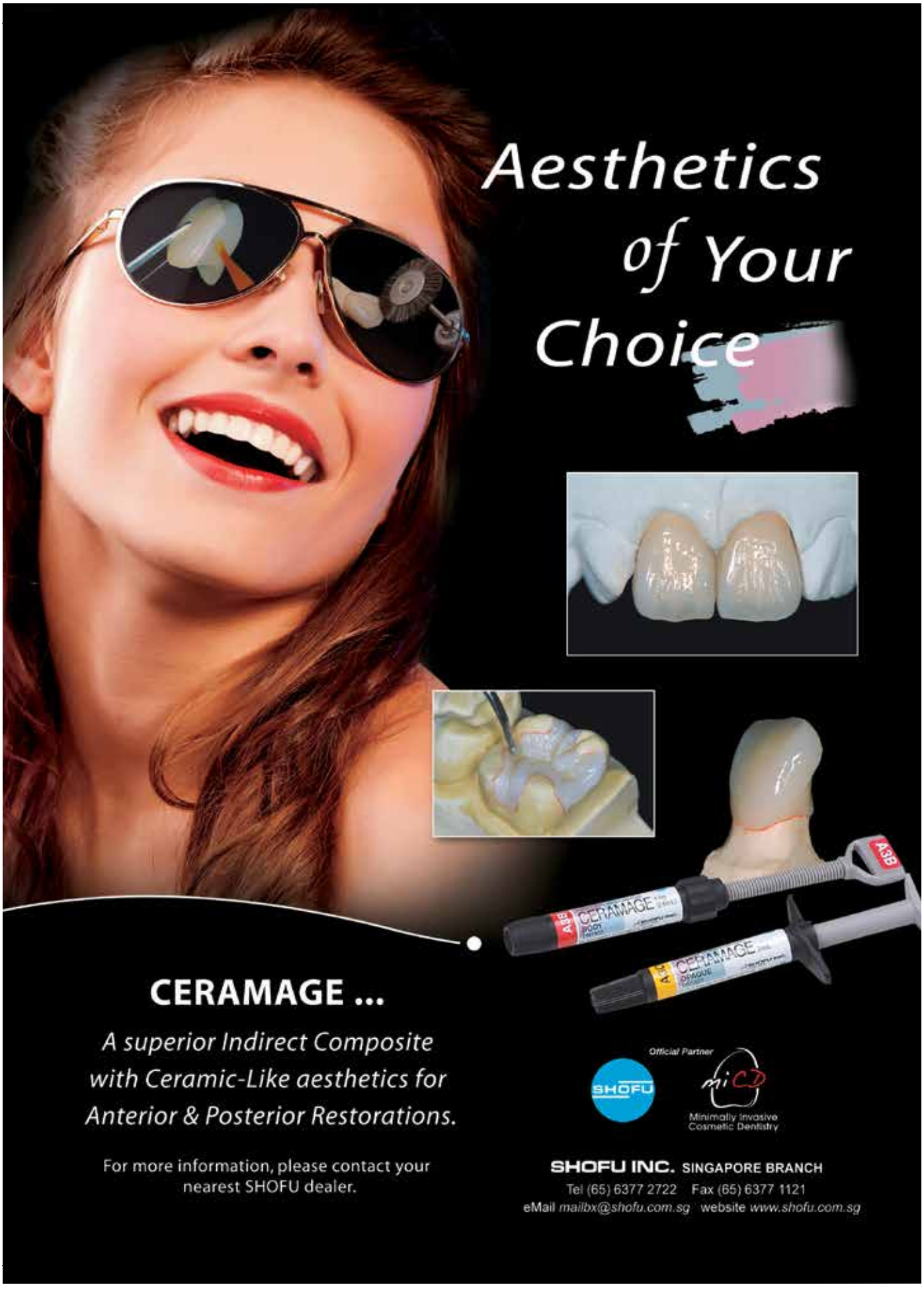
Conclusion

By co-operation of surgeon, pediatrician and anesthesiologist, the patient had operation done at the age of 5 months successfully, without any complications. A team work approach brought a successful outcome in this rare case of superior ankyloglossia.

References

Bolling R.P., Sabeeh V., Stewart J.M.Jr, Newsome. R.E., Moses M.H., Ankyloglossum Superius syndrome : diagnosis and surgical management. J Craniofac surg. 2007, 18(5):1094-7.

Kothari P.R., Gupta A., ankyloglossia superior. Indian Pediatrics 2005, 42: 1249.


Aesthetics
of Your
Choice
CERAMAGE ...
A superior Indirect Composite
with Ceramic-Like aesthetics for
Anterior & Posterior Restorations.
For more information, please contact your
nearest SHOFU dealer.
Official Partner
SHOFU
miCD
Minimally Invasive
Cosmetic Dentistry
SHOFU INC. SINGAPORE BRANCH
Tel (65) 6377 2722 Fax (65) 6377 1121
eMail mailbx@shofu.com.sg website www.shofu.com.sg

Compendium of
Glass Ionomers ...

Experience the difference

Higher fluoride release and recharge

Enhanced physical properties

Higher compressive strength

Higher bonding strength

Easy mixing and improved handling

For more details, please contact our authorized SHOFU dealer TODAY!

SHOFU INC.
SINGAPORE BRANCH 10 Science Park Road, #03-12 The Alpha Science Park II, Singapore 117684
Tel (65) 6377 2722 Fax (65) 6377 1121 eMail *mailbx@shofu.com.sg* website *www.shofu.com.sg*

Bioactive Materials for Esthetic and Functions ...

Photographs courtesy of Dr. Sushil Koirala

BEAUTIFIL II 4.5gm, a Nano-Hybrid Composite with flouride release & recharge, is perfect for direct restorations that requires optimum aesthetics and biocompatibility.

Minimally Invasive Cosmetic Dentistry

Giomer PRG Technology

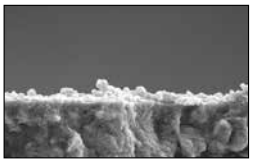
Created for ...

- Direct cosmetic tooth modifications
- Restoration of Class I to V cavities
- Restoration of Cervical Erosion and Root Caries
- Repair of Fractured Incisal Edges
- Laminate Veneers and Core Build-Ups

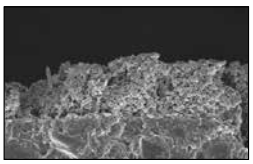
Benefits ...

- ✔ Sustained Fluoride Release & Recharge
- ✔ Natural Fluorescence
- ✔ High Level of Radiopacity
- ✔ Enhanced Handling with Excellent Polishability
- ✔ 8 years of Clinical Success
- ✔ Anti-Plaque Effect

BeautiBond – One-Step Bonding System



BEAUTIFIL II (with S-PRG filler) exhibits sporadic plaque formation on restored tooth surface



Conventional Composite Resin (with no S-PRG filler) exhibits proliferated plaque formation on restored tooth surface

Photographs courtesy of Prof. Koji Yamamoto of the ASAHI University.

THE DENTAL ADVISOR ++++½

Editors' Choice

a 95% Clinical Rating Product

Ideal for patients with a high caries index.

SHOFU

Chemistry Behind Every Smile
www.shofu.com.sg

Authorized Dealer:

ORAL CARE CO.,LTD
Tel: (95) 9540 8243 / (95) 97390 1055
Ph: 0973901055 / 09421083033

OralCare
Because we care

"THE WHITE AMALGAM"

A Novel Zirconia Reinforced Self-Adhesive Restorative that combines Amalgam like Strength with the Protective benefits of Glass ionomer

- Enhanced strength for load bearing areas
- Fluoride release & recharge
- No need for extensive cavity preparation
- Helps conserve sound tooth structure
- Eliminates the risk of mercury

For more information, kindly contact your nearest SHOFU dealer TODAY!

SHOFU DENTAL ASIA-PACIFIC PTE. LTD.
10 Science Park Road, #03-12 The Alpha Science Park II, Singapore 117684
Tel (65) 6377 2722 Fax (65) 6377 1121 eMail *mailbx@shofu.com.sg* website *www.shofu.com.sg*

FDA CE 0434

Portable X-ray System PROX

Anytime!

Anyplace!

- *User-friendly* design
- *High frequency* X-ray
- Fine image but *Low dose* radiation
- Anatomical select buttons for *Easy Setting*
- Working great with *Film and Sensor*

DigiMed

OralCare

Ph. 09 73901055, 09 421083033

DPC-04 (Rev. 1.2) 2014.04.28

www.digimed.co.kr

CE 0434

Wireless Portable X-Ray

Biox

Anytime
Anyplace

Handy and Powerful

Excellent Image

Ergonomic Design

DigiMed

www.digimed.co.kr

OralCare
Because we care
Ph: 09 73901055, 09 421083033

LASCOD

LEADERSHIP

Kromopan®
Alginato cromatico per impronte elastiche di alta precisione
Chromatic alginate for high precision and elastic impressions
LASCOD
DUST FREE - ISO 1563
Class A - Type I - FAST
MADE IN ITALY

MADE IN ITALY

KROMOPAN, a revolution in the dental world for easy to take, high quality dental impressions. With the chromatic phase indicator (LASCOD patent) you visually control the different working phases avoiding useless and costly waste of time. KROMOPAN' success story is strictly linked to its adaptability to different techniques, diverse clinical case requirements as well as to your habits and country's climate. Easy to use, accurate and stable over time KROMOPAN simplify your daily operating requirements.

For further information activate the QR Code reader on your smartphone.

LASCOD S.p.A. - Via L. Longo, 18 - 50019 Sesto Fiorentino, Florence, Italy - tel.: +39 055 4215768 - e-mail: lascod.italy@lascod.it
www.lascod.com

QUITANET PLUS

Concentrated cleaning and disinfection solution for dental instruments

INDICATIONS

- Instrument cleaning and disinfection

FEATURES & BENEFITS

- Economical to use: the diluted (2%) solution remains active 24 hours.
- Can be used in a soaking tank and in ultra-sonic tank.
- Bactericidal in 10 min, 1%, 20°C: EN1040, EN 13727, EN 14561.
- Yeasticidal in 10 min, 2%, 20°C: EN 1275, EN 13624 and EN 14562.
- Tuberculocidal in 30 min, 2%, 20°C: EN 14563.
- Active against HIV – 1, Herpes virus and PRV (surrogate of HBV) in 5 min, 0.1%, 20°C, against BVDV (surrogate of HCV) in 10 min, 0.25%, 20°C and against Influenza virus A [H1N1] in 5 min, 0.75%, 20°C.

SHOFU
Technique Kits ...

Your Answer to Satiny-smooth Polish

A comprehensive range of well-organized Technique Kits from the Leader in Abrasives...

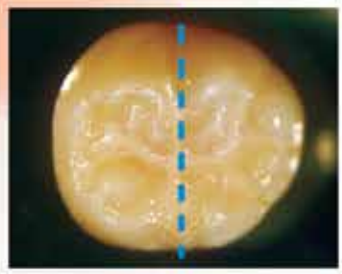
Carefully selected to meet all your polishing needs for ceramics, resin composites, glass ionomer and silver amalgam

SHOFU DENTAL ASIA-PACIFIC PTE. LTD.
10 Science Park Road, #03-12 The Alpha, Science Park II, Singapore 117684
Tel: 65-6377 2722 Fax: 65-6377 1121 eMail: mailbx@shofu.com.sg www.shofu.com.sg

BeautiSealant

Fluoride Releasing & Recharging, Light Cure Pit & Fissure Sealant

Photograph courtesy of Dr. Satoshi Fukumoto, Tohoku University, Japan



Secure a Perfect Seal ...
QUICK, SIMPLE & GENTLE

- No phosphoric acid etch & rinse
- All round fluoride protection
- Superior bond strength
- Remarkable flow
- Smooth & Bubble-free texture
- Precise delivery to deep pits & fissures

For more information, simply contact your nearest SHOFU dealer.

SHOFU DENTAL ASIA-PACIFIC PTE. LTD.
10 Science Park Road, #03-12 The Alpha Science Park II, Singapore 117684
Tel (65) 6377 2722 Fax (65) 6377 1121 eMail *mailbx@shofu.com.sg* website *www.shofu.com.sg*